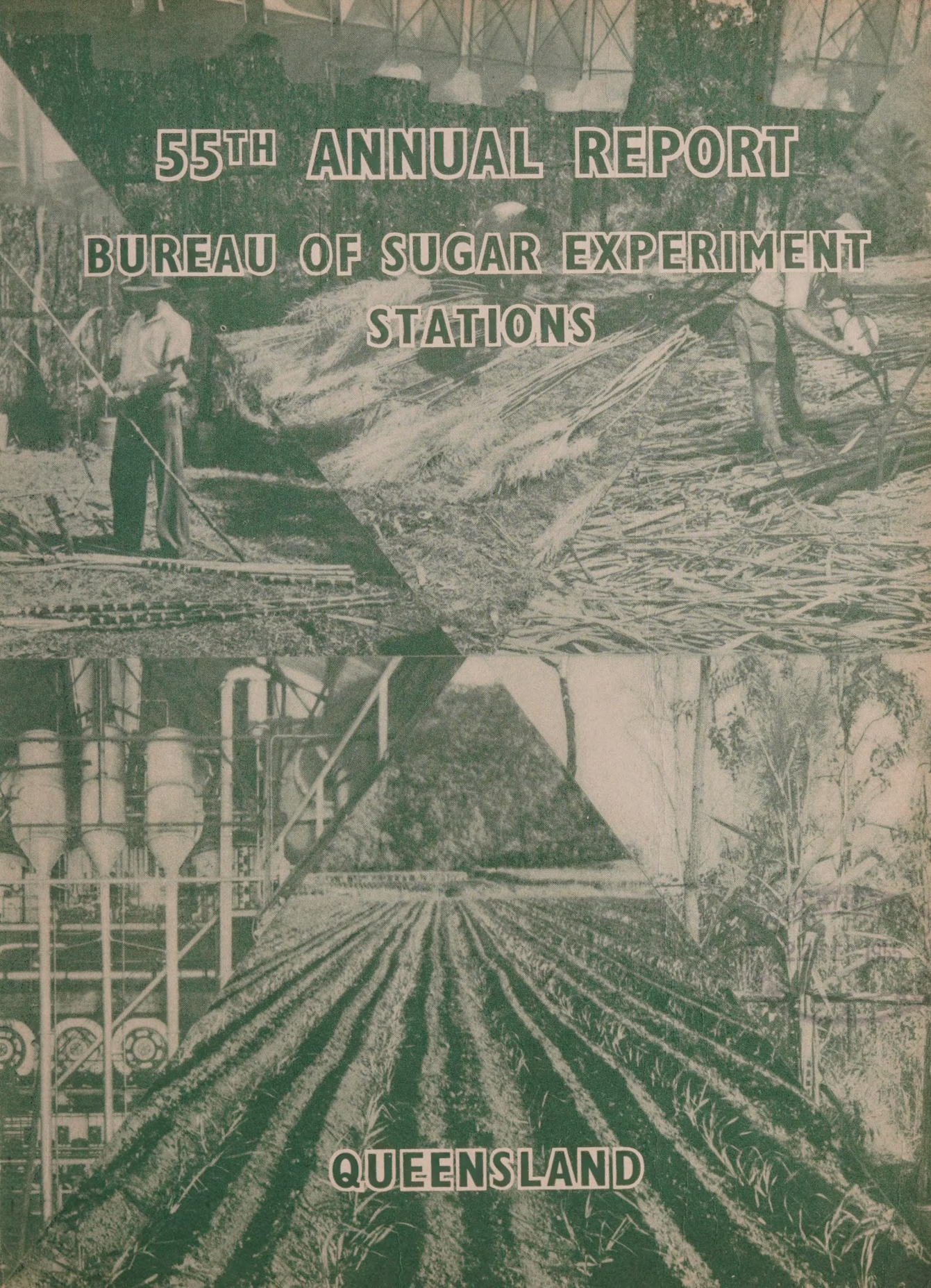
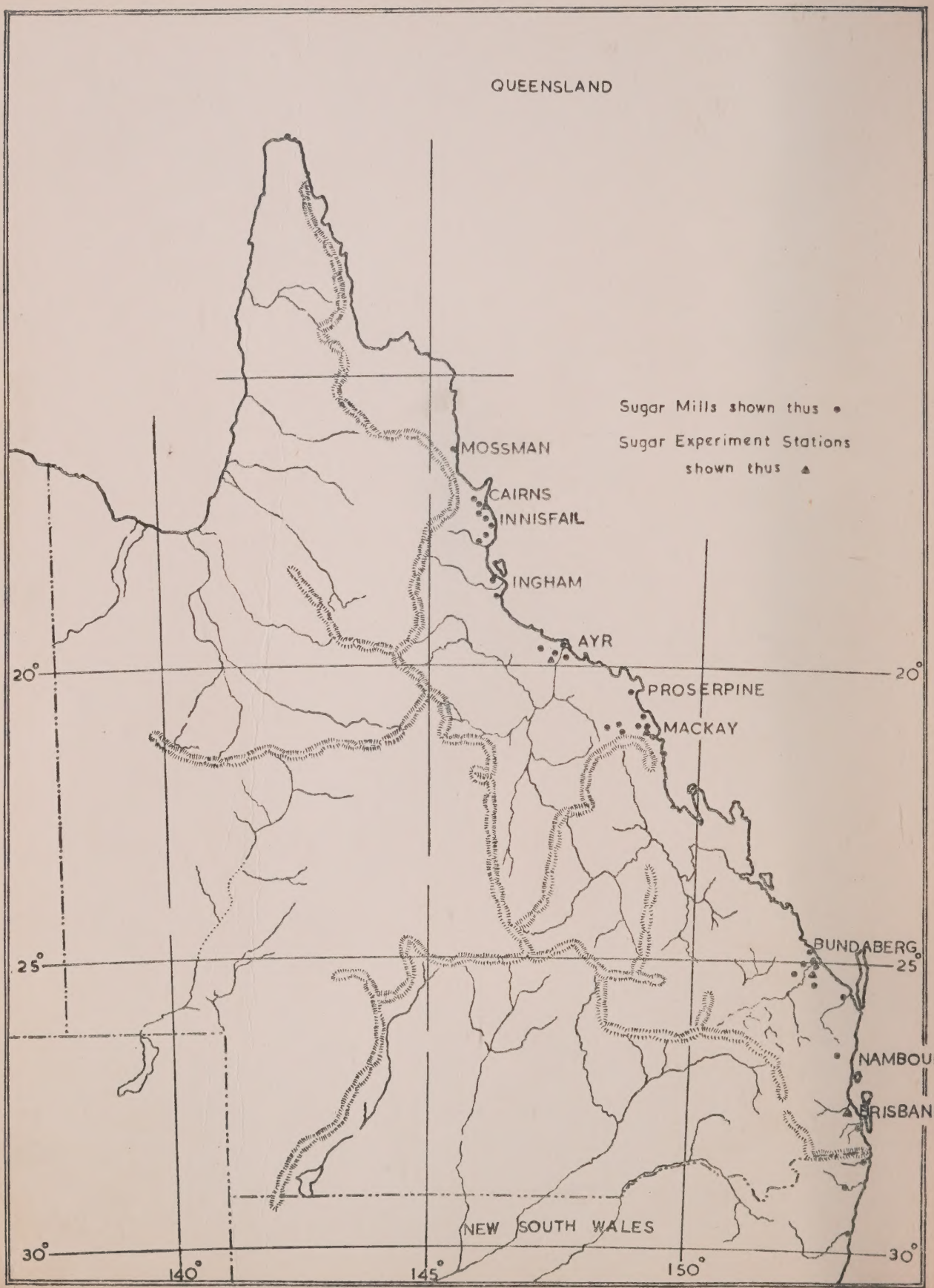


# 55TH ANNUAL REPORT

# BUREAU OF SUGAR EXPERIMENT STATIONS

## QUEENSLAND


QUEENSLAND
Sugar Mills shown thus •
Sugar Experiment Stations shown thus ▲
MOSSMAN
CAIRNS
INNISFAIL
INGHAM
AYR
PROSERPINE
MACKAY
BUNDABERG
NAMBOUR
BRISBANE
NEW SOUTH WALES
20°
25°
30°
140°
145°
150°

1955

QUEENSLAND

# FIFTY-FIFTH ANNUAL REPORT OF THE BUREAU OF SUGAR EXPERIMENT STATIONS

REPORT OF THE DIRECTOR

TO

THE HON. THE SECRETARY FOR AGRICULTURE AND STOCK

*(As required by "The Sugar Experiment Stations Acts, 1900 to 1954")*

BRISBANE

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MR. A. F. BELL, Under Secretary for Agriculture and Stock, Deputy Chairman.
MR. J. W. INVERARITY, Member.
MR. L. G. SCOTNEY, Cane Grower, Member.

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L. G. VALLANCE, Asst. Director.
R. W. MUNGOMERY, Asst. to Director.

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D. R. L. STEINDL, Senior Pathologist (II).

J. H. NICKLIN, Chief Technologist (Engr.).
L. R. BRAIN, Mill Technologist.
A. D. DOOLAN, Asst. Mill Technologist.

G. BIESKE, Chemist.
K. C. LEVERINGTON, Chemist.
J. M. SEDL, Asst. to Analysts.

C. C. HORNE, Secretary.
A. D. BEAL, Asst. Accountant.
S. C. LEDDY, Records Clerk.
E. J. BARKE, Clerk.
B. L. DOOLAN, Clerk.

B. T. EGAN, Asst. Pathologist.
J. R. POLLOCK, Asst. Pathologist.

J. D. HARLAND, Asst. Mill Technologist.
R. DEICKE, Asst. Mill Technologist.
J. D. WATSON, Technical Officer (II).

J. R. BURGE, Asst. to Analysts.
F. SHORT, Lab. Attendant.

MISS F. M. DOOLAN, Clerk-Typiste.
MISS J. E. MURPHY, Clerk-Typiste.
MISS B. A. MURPHY, Clerk-Typiste.
MISS P. D. JOHNSON, Clerk-Typiste.
MISS H. R. PICKETT, Clerk-Typiste.

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G. WILSON, Senior Entomologist (II).
J. C. SKINNER, Senior Geneticist (II).
G. BATES, Senior Adviser.
E. A. PEMBROKE, Senior Adviser.
B. E. HITCHCOCK, Asst. Entomologist.

A. G. BARRIE, Asst. Agronomist.
N. G. GRAFF, Technical Officer (I).
F. C. LINDSAY, Technical Officer (I).
L. E. RODMAN, Cadet.
MISS P. L. GRIFFIN, Clerk-Typiste.
MISS M. BUZACOTT, Clerk-Typiste.

**Innisfail:**

S. O. SKINNER, Senior Adviser.

J. ANDERSON, Field Assistant.

**Ingham:**

O. W. D. MYATT, Senior Adviser.

**Ayr:**

G. A. CHRISTIE, Senior Adviser.
J. WESDORP, Asst. Agronomist.
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**Mackay:**

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C. McALEESE, Field Assistant.

G. H. WHITAKER, Cadet.
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B. G. ADKINS, Mill Technologist.
A. G. CLAIRE, Mill Technologist.
N. McD. SMITH, Senior Adviser.

R. B. MOLLER, Asst. Agronomist.
C. L. TOOHEY, Adviser.
MISS R. MESSER, Clerk-Typiste.

**Nambour:**

C. A. REHBEIN, Adviser.

# Fifty-fifth Annual Report of the Bureau of Sugar Experiment Stations

*To the Honourable the Secretary for Agriculture and Stock*

Dear Sir,

I have the honour to submit the Annual Report of the Bureau of Sugar Experiment Stations for the year ended June 30th, 1955.

Following my introductory comments on the sugar season, and on the activities of the Bureau during the period, are the separate Divisional Reports. These deal with soils and agriculture, pathology and entomology, cane breeding and mill technology. The four Experiment Stations have dealt in detail with their operations, and the usual sugar statistics are supplied.

## THE 1954 SEASON.

For the first time in its history Queensland's crushing exceeded nine million tons of cane and it was, in fact, not far short of ten million. The actual amount which was harvested, transported and processed totalled 9,864,305 tons, exceeding the previous year's figure by 1,113,242 tons. The raw sugar produced did not show the same proportionate increase, but the aggregate outturn of 1,301,245 was also a record and surpassed by 80,862 the 1953 production.

The New South Wales figures for the 1954 season were 222,366 tons cane crushed and 26,290 tons of 94 n.t. sugar manufactured; the total figures for Australia are therefore 10,086,671 and 1,327,535 tons of cane and sugar respectively.

With the exception of the Bundaberg areas the sugar content of Queensland crops was lower than since 1950. Unseasonable rains, an open winter and considerable lodging in large crops all contributed to this condition. There was also evidence that the amount of extraneous matter loaded with the cane had some influence in lowering the c.c.s. content; this factor was, to some extent, a not unexpected concomitant of mechanical loading under wet conditions, but it was more largely due to less strict attention to clean topping and loading with a large crop and a proportion of inexpert labour.

The handling of the record crop was a frustrating experience for farmers and millers alike. A strike in the works of the industry's largest machinery supplier delayed crushing in some mills; a shortage of experienced cutters soon had its effect on harvesting; the migrant labour supplied for cane cutting was inefficient; and competition for labour contributed to the extraordinarily high cutting rates. These harvesting difficulties brought in their train a very much heightened interest in mechanical cutting and loading devices and it is probable that, irrespective of future labour supply and efficiency, the mechanization movement will gain considerable impetus.

The record tonnage of sugar produced was not without its embarrassments to the industry. The limitations imposed by a strict export quota and a somewhat static home market created a storage and carryover problem for the balance of the production. This, however, is a situation which, from time to time, will face an industry planning to fill contracts on a yearly basis unless, as has now been done, restrictive measures are imposed on production. The danger of continued restriction arises when a sub-normal season follows a year of reduced plantings.

Some of the problems associated with new land, which were mentioned in the last report, were again

encountered in the year under review. The principal one was not associated with nutritional deficiency, but the reverse. The rank growth and consequent lodging on some of the rich alluvial soils is a real problem and its solution would appear to lie in the development of a new varietal concept. Paradoxical as it may seem, successful cane farming on such lands is bound up with growing *less* vigorous canes possessing the characters of lodging resistance and higher sugar content.

Real progress was made in preparing for the bulk handling of the raw sugar output, particularly at Mackay, which will be one of the principal outlets for export sugar. Several other ports have been surveyed and listed for bulk installations. During the year about a quarter of a million tons of raw sugar were shipped in bulk—loaded by the bag bleeding method. There are still many problems to be solved when port facilities are available, not the least being the regular and reliable transport of sugar from mill to port storage.

Crushing, which commenced simultaneously on May 26th, 1954, at Hambledon, South Johnstone, Tully and Inkerman, did not finish until February 5th, 1955, at Inkerman Mill.

As an indication of aggregate crushing capacity of the State's mills it has become usual in this report to quote the cane intake over a seven-week period at the peak of the season. During 1954 the average aggregate figure for this period was 359,901 tons—a slight increase on the 1953 record. It cannot be expected that weekly cane intake will increase much beyond this figure in future years or—at least—while mill crushings are restricted to peak outputs.

Victoria mill, with its dual milling train, handled 687,269 tons of cane for the season, while Inkerman set a new record for a single milling train in Queensland, its figure being 513,114. This was the first occasion on which the half million ton mark has been passed by any single-train Queensland mill. Altogether six mills in the State crushed more than 400,000 tons each.

Despite the good seasons which have been experienced there is little doubt that the very large crops are the result mainly of the expansion scheme. Examination of the figures for the past three years discloses that, while tons of cane per acre has ranged only from 24.9 to 26.8, the area harvested has climbed from 274,757 to 367,650 acres.

## THE PROSPECTS FOR 1955 SEASON

The run of good seasons, which has given considerable stability to the sugar industry since 1951, has extended into 1955. With the exception of the southern area, which experienced a dry period in December and January last, climatic conditions favoured rapid crop development in all districts during the high-temperature months. Cyclonic conditions, gale force winds and floods caused damage of a serious nature in several districts and, as late as June, 1955, advanced crops were flattened by unseasonal heavy rains. The crop losses incurred as a result of these conditions were not large when considered on an industry-wide basis, but they were serious in the districts concerned.

The extended wet season in the far north, with its accompanying lack of sunlight, affected crop maturity, and cane crushed in June was of lower sugar content than is normal at that period. The very heavy arrowing in all districts must also have an effect on late crop development and it can be anticipated that final estimates will not reach the early forecast published in June. That forecast, collected from the mills during May, 1955, disclosed an expected crop of 9,230,000 tons of cane with a potential output of 1,254,000 tons of 94 n.t. sugar; the actual tonnages crushed and manufactured will be dependent, of course, on any restrictive measures imposed to limit output to market requirements.

It would not be surprising if the late wet conditions, the heavy arrowing, the undisclosed wind damage and low sugar content resulted in a raw sugar figure not much in excess of aggregate mill peaks. There has undoubtedly been a general tendency, in crop estimating, to allow for the appreciable late growth which characterises many of our commercial varieties. The large proportion of arrowed cane and the deterioration in lodged crops will, to a large degree, cancel out such expectation.

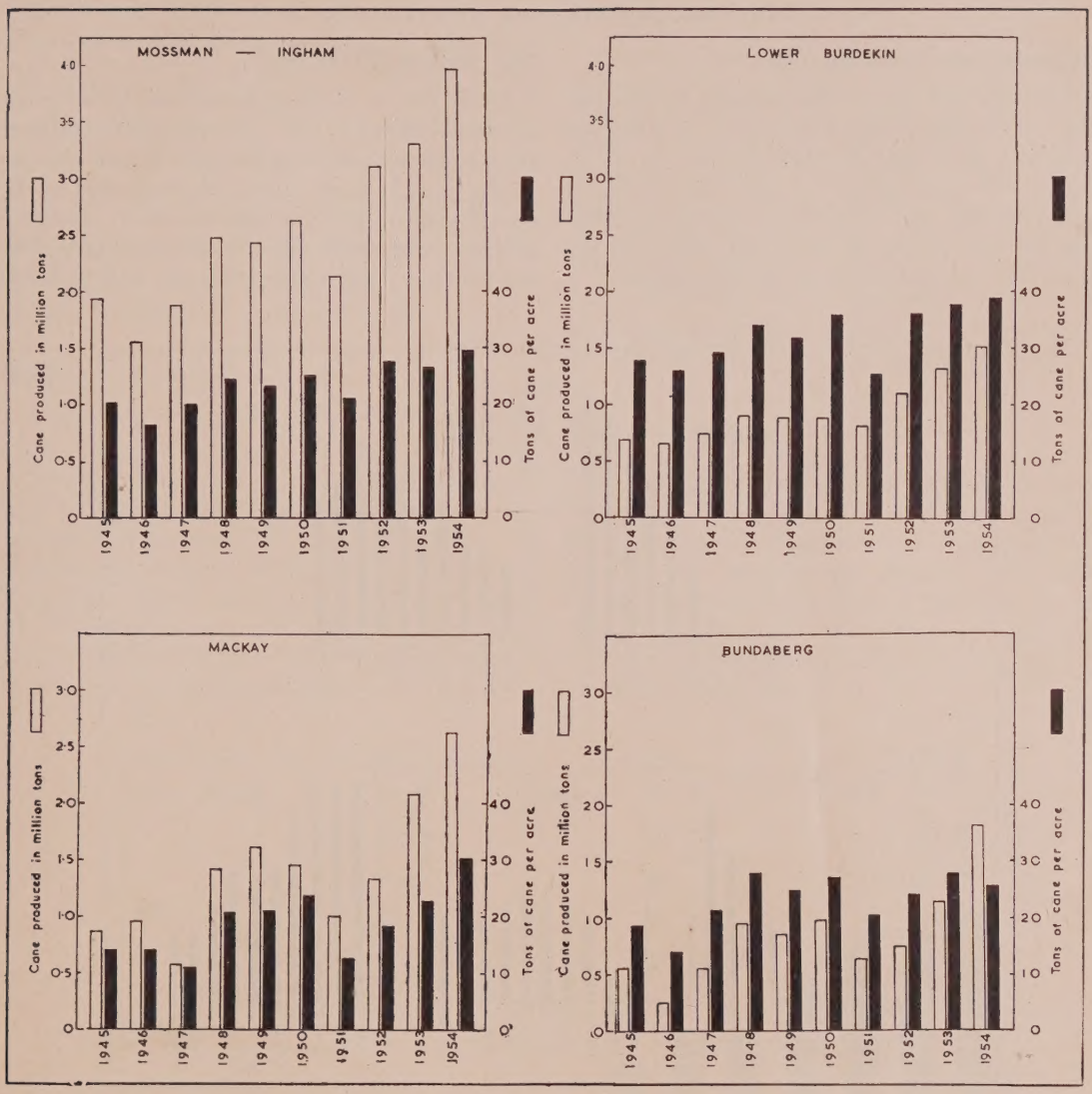



**Fig. 1—Total cane production and tons per acre in the four major districts during the past ten years.**

The New South Wales mills have estimated their 1955 crop at 284,000 tons of cane and 33,000 tons of 94 n.t. sugar.

In last year's Annual Report some comment was made regarding the possibility of a smaller crop in 1956, due to the undue proportion of the State's acreage which would be fallow; this state of affairs would be consequent upon the larger than normal plantings in 1952—during the expansion period—and the ploughing out of such acreages after the 1955 harvest. The abnormally wet conditions of 1955 prevented the usual early planting in most districts, and it follows that this will be done in spring, if at all. Since late plantings will not produce as heavy crops as the usual early ones, the effect on 1956 production will be accentuated. Unless Queensland experiences a very favourable season for the growth of the 1956 crop it is unlikely that the aggregate peak will be attained.

## COMMENTS ON 1954 STATISTICS

### Estimate and Final Figures

The Bureau's crop estimate issued in October, 1954, predicted a production figure of 9,938,000 tons with an output of 1,325,000 tons of 94 n.t. sugar. The final figures achieved were 9,864,305 and 1,300,751 tons respectively, being less than one per cent. lower in cane, and some two per cent. lower in sugar than the forecast figures.

### The Ratoon/Plant Ratio

Table III is, to some extent, an indicator of rotational changes. The alteration in the ratio of plant to ratoon cane harvested reflects such changes as are brought about by the big expansion of the past few years and the influence of a restrictive policy. In the 1954 crop the ratio of ratoon/plant to cane was 1.49, compared with 1.12 in 1953;

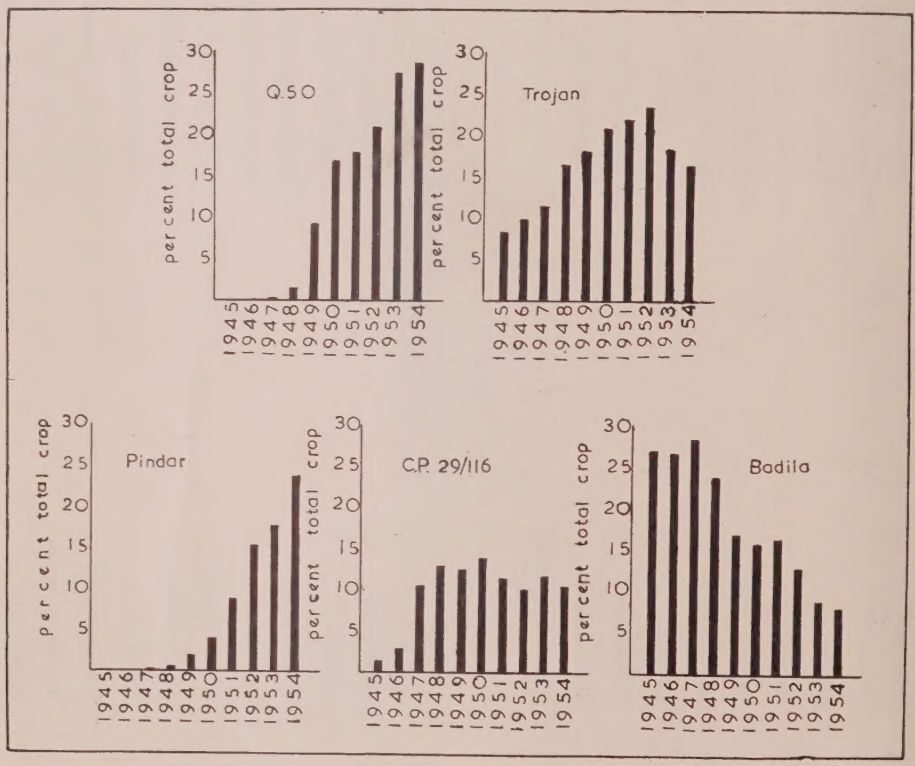



**Fig. 2—The five major varieties in recent years—illustrating varietal trends.**

### Area Harvested

Once again there was an upward movement in the total area harvested for crushing. The rise from 332,703 to 367,640 acres was brought about by the expansion programme, and the extra 35,000 acres probably represented the bulk of the new land which had not been planted prior to 1953. There is no question that this acreage is unlikely to be exceeded in the foreseeable future; restriction to available markets will tend to reduce the area under harvestable crop.

the 1953 figure was abnormally low because of extensive plantings in the previous year, but there should be an upward trend to 1955. The Lower Burdekin, as a result of its "plant cane policy", has the extraordinarily low ratoon/plant ratio of 0.71; the theoretical ratio with a plant and two ratoon crops would be 2.0.

### Lower Burdekin's High Yields

As is usual, and to be expected, the four mill areas of the Lower Burdekin district produce the

heaviest crops in the State. For the 1954 crop they averaged 39.16 tons of cane per acre, which is a new record; it is assisted, naturally, by the higher proportion of plant cane. The sugar yield was 5.61 tons per acre which, calculated on an average age of 16 months for the crop, gives 785 lb. of sugar per acre per month for the entire district. Of the four mills Inkerman again topped the productivity list. With a harvested crop of 513,114 tons, the yields were 46.4 and 6.71 tons of cane and sugar per acre respectively.

### Molasses Figures

Here there was little change when compared with the previous year. The total output was within 600 tons of 1953 production and the amounts used in distilleries, for fertilizer and for stock feed was in approximately the same proportions. A sudden rise of nearly 6,000 tons in the amount burnt as mill fuel is difficult to understand. Should the Bureau's experiments with molasses-bagasse stock foods be successful there should be a change in these figures in future years.

### Production in Districts

North of Townsville (10 mills) was again the largest producer, with Mackay (eight mills) second and the Lower Burdekin (four mills) third. The North of Townsville section was also in second place with yield of cane per acre, a position which is generally filled by Bundaberg. The production in the various major divisions of the State indicates that, in the 1954 crop, 40 per cent. of the total cane was grown north of Townsville, 27 per cent. in Mackay-Proserpine, 18 per cent. in the southern division, and 15 per cent. in the Lower Burdekin.

### Length of Season

In last report the effect of increased crushing rate on length of season was commented on. For the 1954 crop the average crushing season for the 31 mills was 28.16 weeks, compared with 25.40 in 1953. This increase of 2.76 weeks, or 11 per cent., was concurrent with a tonnage increase of 12.7 per cent., indicating a slight improvement in average crushing rate.

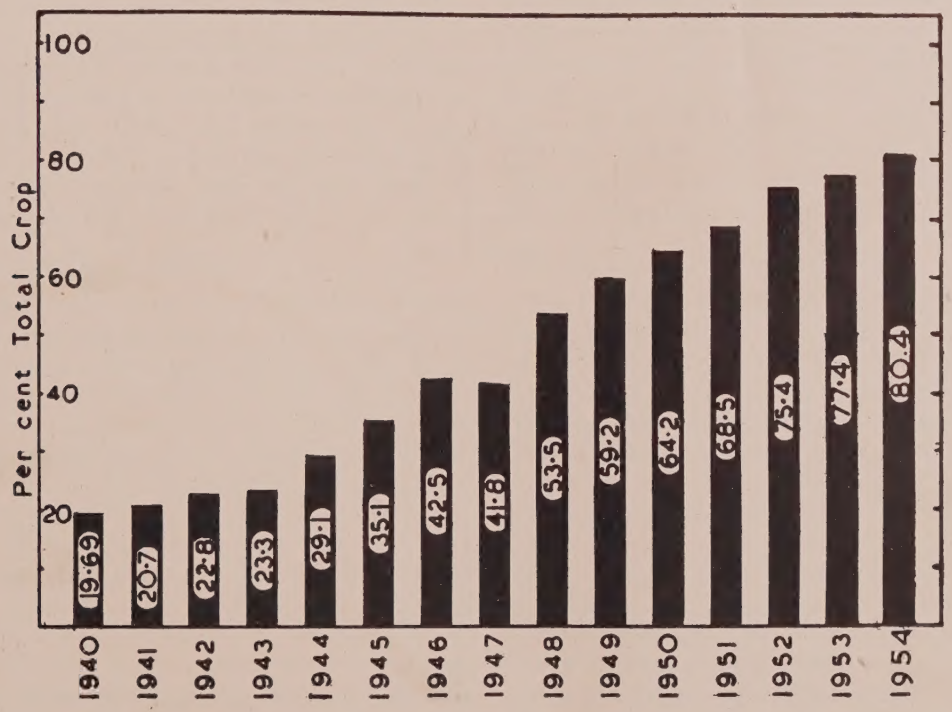



**Fig. 3—Between 1940 and 1954 the percentage of Queensland-bred varieties in the total crop increased from less than 20 to over 80 per cent.**

### Q.50 Still the Premier Cane

Q.50 proved for the second year in succession to be the State's most popular cane. Over 2,800,000 tons of this variety were harvested for crushing, representing 28.4 per cent. of the total Queensland crop. This was 400,000 tons more than in 1953. It is somewhat disquieting to see one variety constituting nearly 90 per cent. of the Mackay district production—since there is always the possibility of the occurrence of a disease to which it may be susceptible—but it is equally satisfying to observe the rising popularity of Q.50 in other areas. Both North of Townsville and in the Bundaberg area the tonnage of this variety harvested was a considerable advance on the previous year.

### The Decline of Badila

There is no longer any doubt that Badila—once King—is dethroned. From a peak of 2,100,000 tons in 1937 it declined to 770,000 in 1954, and was less than eight per cent. of the total crop. It is only in the Mulgrave, Babinda, Tully and Innisfail mill areas that Badila constitutes more than 10 per cent. of the harvest. It remains the premier variety in Babinda and South Johnstone, but past experience suggests that it is only a matter of time before it is superseded in those districts as it has been elsewhere in the tropical belt.

## BUREAU ACTIVITIES

### Pathologist Studying Overseas

Although several major cane diseases, which once were widespread in our industry, have been eradicated, there are ample disease problems awaiting elucidation. The Sugar Experiment Stations Board, recognising the need for even better disease control, agreed that the Bureau's Senior Pathologist, Mr. C. G. Hughes, should visit pathology institutes in Europe and America to study latest advances in plant pathology, and more particularly in virus research. Mr. Hughes' study tour, which began in May, 1955, will take him to England, Holland, France, Sweden, Canada, United States and Hawaii. He will be absent from Queensland for about four months.

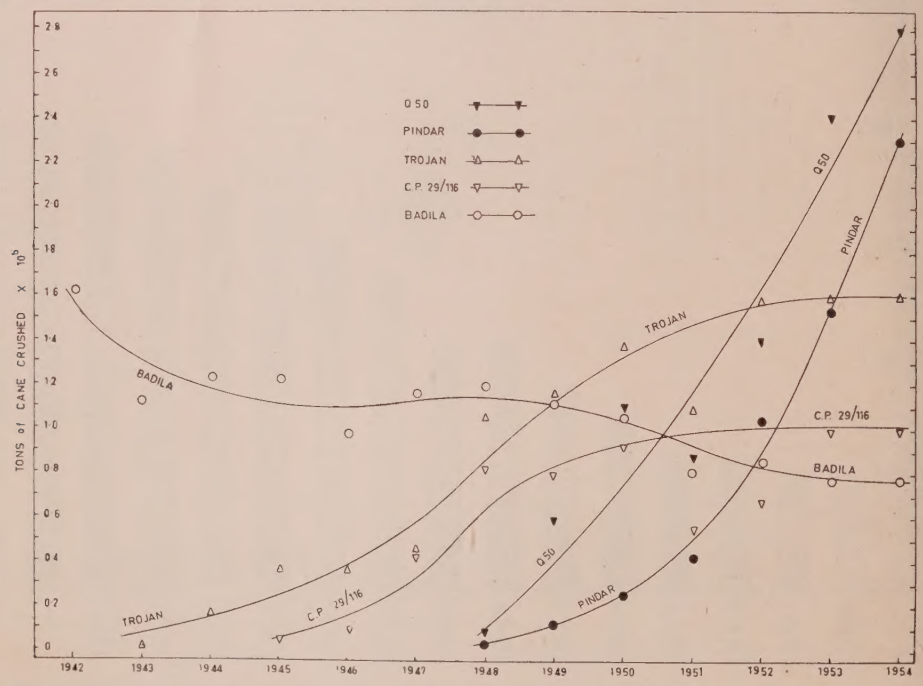



**Fig. 4—Illustrating the decline of Badila, the probable peak of Trojan and C.P.29/116, and the rise of Q.50 and Pindar in recent years.**

### Bureau Seeks the Latest in Cane-breeding Research

Another Bureau officer who has gained experience overseas during the past year is the Senior Cane Breeder, Mr. J. H. Buzacott. He visited the Philippines, India, Mauritius and Natal to meet geneticists and cane breeders in those countries. Already Mr. Buzacott has introduced to our cane-breeding programme certain improvements—the result of his overseas discussions. A report on his overseas observations has been printed and distributed.

### The Changing Varietal Scene

Statistics printed elsewhere in this report provide interesting data on the cane variety position. Four varieties, all producing over a million tons each—and two of them over two million tons each—dominate the picture. These four canes, Q.50, Pindar, Trojan and C.P.29/116, collectively represent 78.6 per cent. of the 1954 crop. And it is pleasing to record that Queensland bred canes contributed the imposing total of 80.3 per cent. of all cane harvested.

Although there should not be any marked change in varietal representation in the near future there are several contenders for honours in all districts. In the far north Q.57, Q.59, Luna and Sirius are looming on the horizon; in the Lower Burdekin Q.57 looks like making the grade; Mackay has Q.58 as a newcomer on the approved list; and in the south there are more canes of promise than for a long time.

### Ratoon Stunting Disease

There has been marked progress in both research and control during the year. The first series of trials, in which were compared the yield capabilities of healthy and diseased planting material, was harvested. Details have been published separately but the summarised results showed that in the Cairns area Pindar and Trojan gave losses of seven and eleven tons per acre respectively as a result of the disease; at Giru with the same varieties, the losses were six and ten tons per acre; at Mackay, P.O.J.2878, Trojan, Q.50 and N.Co.310 were four, eight, two and six tons per acre less in the diseased plots; and at Bundaberg the loss with C.P.29/116 was four tons and, with Pindar, two tons. The ratoons of all trials will be harvested this year.

There have been some disease findings in hot-water treated cane. At time of writing the picture is not clear; doubt is thrown on the efficiency of some of the treatment tanks, principally in respect of inadequate circulation of water and the use of unsuitable plant containers. There is also reason to believe, after well controlled treatments, that a varietal factor may be involved. Such matters as pithy plants, setts with hollow areas, and high fibred varieties need further investigation. Trials have already been planted with thick and thin setts of the same variety—after subjection to hot-water treatment. The location of fibre bundles in different varieties may be important because of the high insulation properties of the fibrous material.

### New Seedling Sub-Station

The year 1955 marked another stage in seedling raising and selection in Queensland. The Bureau, in furtherance of its plan to grow and select seedling canes in a wide range of environmental conditions, established a new sub-station in the Mourilyan area. On a flat, uniform area of soil of schist origin some six acres will be devoted to an extension of seedling activities. Beginning in 1955, and annually thereafter, a minimum of one thousand seedlings will be planted, selections made, and the promising canes replanted in progressive trials. There must logically be a better chance of selecting, in that area, varieties which will be suited to the 150-180 inch rainfall belt which extends from Babinda to Tully.

### Verticillium in South Queensland

The failure of several crops to ratoon in the Bundaberg-Isis district has been found to be associated with the presence of a fungus of the verticillium type. It is, nevertheless, too early to state that the fungus is the sole cause of the stubble failing to produce a ratoon stool. Investigations by a pathologist suggest that some underlying or predisposing factor may have enabled the fungus to gain ascendancy. An agronomist, recently transferred to Bundaberg, will work on the problem and attempt to establish corrective or control measures. The sudden outbreak of this trouble emphasises the need for constant vigilance in disease matters. Eradication of known diseases does not necessarily confer a state of unlimited cleanliness on an area.

### Molasses-Bagasse Mixtures as Stock Foods

The Bureau interested itself in this matter during the past two years (*a*) as a possible means of disposing of surplus bagasse which was becoming an embarrassment at several mills, and (*b*) as a solution to the problem of molasses transport to areas where it was used as a stock feeding supplement. The practicability of preparing dry mixtures, transportable in jute sacks, and with good storing qualities throughout a wet summer was soon established. A quantity of several tons has now been supplied to the Animal Health Station of the Department of Agriculture and Stock for controlled feeding trials which are being conducted. This co-operative venture could well be the start of a large stock-food industry in the sugar belt. The establishment of such an industry in association with a sugar mill would ensure that profits from the undertaking would be made by the sugar industry.

### Legume Seed in Better Supply

Much larger acreages of green manure crops than normal were planted in the sugar belt in late 1954. This was the direct result of increased velvet bean seed supply following the importation of some hundreds of tons. Queensland cane growers have been starved for seed of this valuable legume owing to inability of local seed producers to supply the demand. Velvet beans have proved their value in both the wet and dry belts, and their resistance to bean fly and wilt have influenced cane growers to plant them in preference to cowpea types.

### Cane Wax Pilot Plant

Another attempt is being made to operate this plant on a continuous, wet-extraction basis. The plant was modified, following successful laboratory studies, and is awaiting supplies of fresh mud when the Bundaberg mills begin the 1955 crushing. A somewhat surprising feature of the year's investigations was the discovery that the wax content drops seriously in stored mud. An advantage of the liquid-liquid extraction method would be that, by virtue of immediate extraction, such deterioration would be eliminated and maximum wax yields would result.

### Copper Deficiency in Sugar Producing Soils

Over a period of years a large number of trace element trials has been laid down in the sugar belt with a view to detecting any deficiencies which may have developed in our sugar producing soils. Despite the great geological age of some of our lands, and the heavy leaching to which they have been subjected in the wet belt, there have been remarkably few cases of poor crops being due to lack of trace elements. A few years ago a crop failure outside Mackay was cured by an application of copper sulphate and there was an occurrence of "droopy-top" in cane at Nambour which seemed to be related to copper and zinc deficiency. More recently "droopy-top" has been located on poor, sandy country in Mourilyan, and there is a suggestion of copper deficiency on a Gooburrum farm in Bundaberg. It is curious that copper should be the only deficient element detected in four such widely separated areas.

### By-Products of Sugar Cane

There is now a well defined world trend in the direction of by-product usage. More countries are exploiting bagasse for paper making, molasses is being more intensively investigated for stock food purposes and for chemical production, and there is a steady interest in cane wax. South Africa is extending its bagasse—paper production and the lack of interest in a similar industry in Queensland is difficult to understand. Any improvement in manufacturing efficiency in the local industry must go hand in hand with an increasing bagasse surplus. It seems paradoxical to chase higher boiler efficiencies if extra money is going to be expended on removing and destroying the extra accumulation of bagasse.

### Disease Transmission Studies

Work proceeded during the year on the possible insect transmission of chlorotic streak and ratoon stunting diseases. These investigations have not, to date, given any clue to either of these diseases being spread by above-ground insects, but the work will continue. Chlorotic streak spreads so rapidly in wet and badly drained locations that a spreading agent of some sort—not necessarily an insect—must be responsible; there is no evidence of similar spread with ratoon stunting disease. The

extension of chlorotic streak in Mackay this year appeared to be directly related to the level of flood waters.

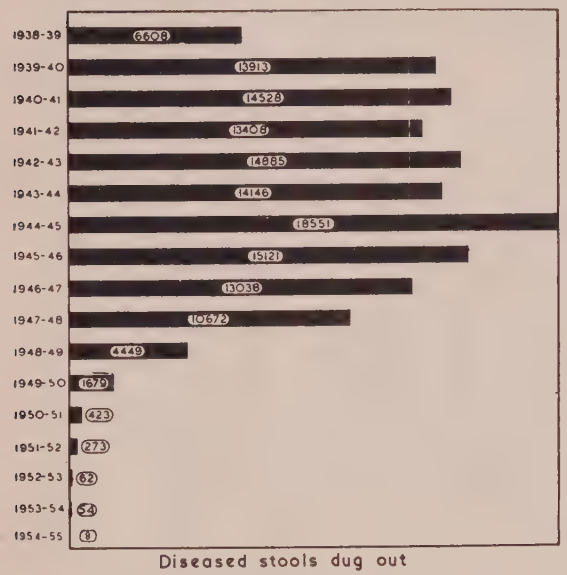



**Fig. 5—Fiji diseased stools dug out, 1938-39 to 1954-55.**

### Red-Spot Disease.

The finding of "red-rot" disease in parts of the Bundaberg district during the year recalled the occurrence of this disease in the early thirties in other parts of the same district. Q.813 and P.O.J.213, which were then affected, are no longer grown, and the disease—never serious—appeared to die out with the introduction of more vigorous canes. The recurrence suggests, however, that the responsible organism persisted until the cane stools were in a condition to allow infection, and that even some modern varieties are not resistant to this minor disease.

### The Remnants of Fiji Disease

In last year's report the hope was expressed that 1954 would see the end of Fiji disease in Queensland. In the 1954-55 year, however, some eight diseased stools were located and destroyed, seven being in the Rocky Point district south of Brisbane and only one in the Moreton area. The complete freedom of the previously diseased Bundaberg, Isis and Maryborough districts confirms the effectiveness of the clean-up campaigns there and it is hoped that the last vestiges of this once serious disease will disappear in the near future. The value of the control is difficult to assess; it means, of course, that susceptible varieties may now be grown with impunity, but the vigilance of the inspectors will not be relaxed.

### New Laboratories at Mackay Experiment Station

A tender has now been accepted for the new Mackay building. Covering some 3,500 sq. feet the new structure will contain a modern soils laboratory and adequate office accommodation for staff requirements for a long time to come. The building will be of brick with tiled roof. It will replace the old wooden offices which have served the Station for 55 years—firstly at the Lagoons and, since 1935, at Te Kowai.

### Giant Sensitive Plant

The extension of this noxious weed, *Mimosa invisa*, in the wet belt has been the cause of considerable concern to the sugar industry. During the year, as the result of continued complaints from land-holders, the State Co-ordinating Board conferred with local authorities and other Government departments to plan concerted action. Some aerial spraying was conducted but it is, as yet, too early to assess the lasting nature of the weedicide used or the effectiveness of the control. The smothering habit of this weed is illustrated in this report. It has been disconcerting to find that, simultaneous with this attempt at eradication, a spineless variant of *Mimosa invisa* is being grown elsewhere in the State for examination as a potential legume for land regeneration. The release of this plant is very undesirable, firstly, because in the young stages it would be indistinguishable from the pest variety and would complicate the eradication campaign and, secondly, because it is possible that it could revert to the spiny type.

### Pathologists from Overseas

During the year several sugar cane pathologists from overseas visited Queensland to discuss disease control methods and to examine, in the field, the results achieved in this country. The first was Monsieur M. H. Barat, Director of the Laboratory of Phytopathology at Tananarive, Madagascar. M. Barat was particularly interested in the Bureau's success in controlling Fiji disease in

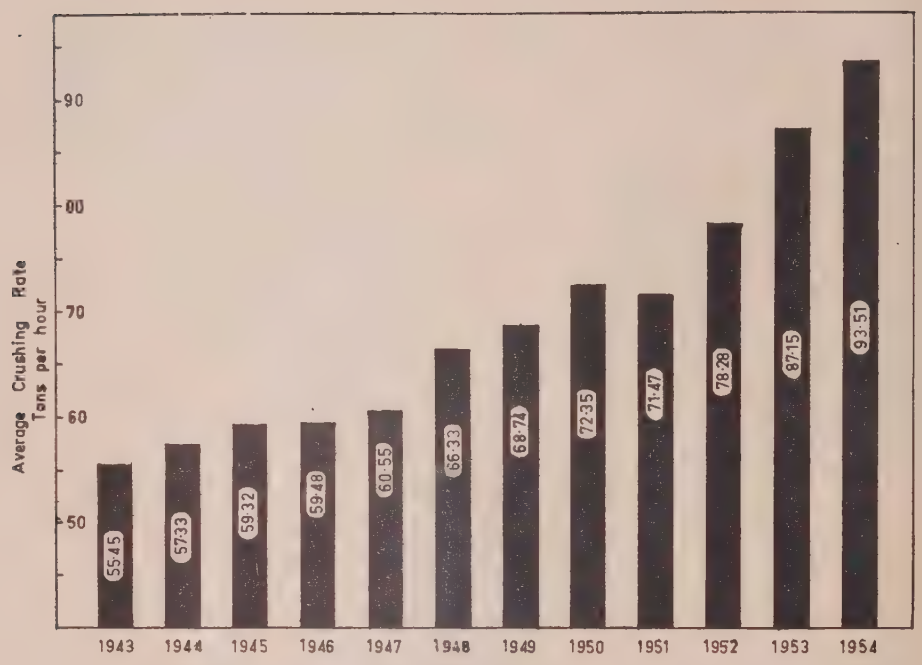



**Fig. 6—Average crushing rate for Queensland mills since 1943. Figures exclude C.S.R. mills, Rocky Point and Eagleby (all years) and Pioneer and Inkerman, 1943 and 1944.**

Queensland, because of the recently discovered outbreak of that disease in his country. During October, Mr. P. B. Hutchinson, Senior Lecturer in Plant Pathology at the Imperial College of Tropical Agriculture, Trinidad, arrived in Queensland. He was anxious to discuss identification and control methods for ratoon stunting disease, and also to see the effects of chlorotic streak and leaf scald diseases. Early in 1955, Mr. P. O. Wiehe and Mr. R. Antoine, Director and Pathologist respectively of the Sugar Research Institute in Mauritius spent some time in the State. These two visitors attended the Sugar Technologists Conference, the Conference of Cane Pest and Disease Control Boards, and made a detailed tour through all sugar districts.

### Maleic Hydrazide and Nut Grass.

Initial experiments at Meringa with maleic hydrazide have shown considerable promise for nut grass control for longer periods than achieved with 2,4-D. These will need confirmation under a range of conditions and at different times of the year, but even with the existing high price of the chemical the subject is worthy of further investigation. This remarkable chemical is already of value to the Bureau for its ability to delay arrowing for several weeks.

### Foreign pollen affects Breeding Programme.

The discovery that our controlled cross pollination work was open to suspicion came as a surprise. Careful studies have disclosed that stray pollen was entering crossing lanterns through the weave of the material and was fertilizing female flowers enclosed in the lanterns. There is also evidence that the open crosses in the light forest adjacent to the Experiment Station are subjected to a low level of pollen contamination from surrounding sugar cane fields. It is apparent that all future bi-parental crossing will have to be conducted in lanterns, covered by a pollen proof material.

### Extension of Cane Breeding.

The large expansion of cane breeding activities at Meringa, and the accompanying research programme on selection methods, etc., necessitates an extension of area in the very near future. Meringa land, by virtue of its lack of uniformity and the poverty of certain sections, is not suited to experimental work. Efforts are being made to acquire suitable land in reasonably close proximity to the Station.

### Staff Losses and Appointments

Mr. J. L. Clayton, Chief Mill Technologist, resigned.

Mr. H. C. Haskew, Asst. Agronomist, resigned.

Miss L. M. Johnson, Librarian, died.

Mr. D. J. Cleary, Cadet, resigned.

Mr. N. J. Williams, Clerk, resigned.

Miss D. S. Sealey, Clerk-Typiste, resigned.

Miss J. J. Christensen, Clerk-Typiste, resigned.

Miss S. J. Paine, Clerk-Typiste, resigned.

Mr. J. D. Harland was appointed Asst. Mill Technologist.

Mr. R. Deicke was appointed Asst. Mill Technologist.

Mr. J. R. Pollock was appointed Asst. Pathologist.

Mr. A. G. Barrie was appointed Asst. Agronomist.

Mr. G. H. Whitaker was appointed Cadet.

Mr. B. L. Doolan was appointed Clerk.

Miss J. E. Murphy was appointed Clerk-Typiste.

Miss H. R. Pickett was appointed Clerk-Typiste.

Miss F. M. Buzacott was appointed Clerk-Typiste.

Miss R. Paine was appointed Clerk-Typiste.

Miss J. L. Cronin was appointed Clerk-Typiste.

## PUBLICATIONS BY BUREAU STAFF

### In the Proceedings of the Queensland Society of Sugar Cane Technologists

Brain, L. R.: Observations on Some Overseas Clarification Processes.

Hughes, C. G.: Recent Developments in the Study of Ratoon Stunting Disease.

King, N. J.: Cane Varieties as a Solution to a Harvesting Problem.

Skinner, J. C.: Notes on the Identification of Sugar Cane Varieties.

Story, C. G.: Mechanical Harvesting and Co-operative Ownership.

Wilson, G.: Temperatures inside Containers in Hot-Water Treatment Tanks.

### In the Louisiana Sugar Journal

King, N. J.: Time and Labour Saving Devices.

### In the International Sugar Journal

Hughes, C. G.: The Control of Ratoon Stunting Disease.

### In the Proceedings of the Pan Indian Ocean Science Congress

Buzacott, J. H.: A Preview of Sugar Cane Breeding in Australia.

### Operations Reports

55/1. Report on a Trial with Automatic Effet Level Regulators.

55/2. Performance of the Blanchard Crystallizers at Mossman Mill.

55/3. The Extraction of Pol from Bagasse—Digestor Method *v.* Disintegrator Method.

55/4. Treatment of Mud with Active Magnesia at North Eton Mill.

### Plant Data Record for Queensland Mills

Fourth Edition.

### Annual Synopsis of Chemical Control Figures

Twenty-third edition.

*Note.*—The Plant Data, and Synopsis of Chemical Control are confidential publications issued only to mills participating in the Mutual Control Scheme.

### Periodic Publications

Four numbers of the Cane Growers' Quarterly Bulletin and two News Letters were issued.

## THE SUGAR EXPERIMENT STATIONS BOARD

Meetings of the full Board were held on August 19th-20th and November 24th-25th, 1954, and on February 9th-10th and May 11th-12th, 1955; in addition the Deputy Chairman and the industry members met for special discussions on January 7th and March 16th, 1955.

The four Experiment Stations were visited during the year, on which occasions Board members were able to inspect station activities and discuss local matters with staff officers. Both industry representatives attended the annual conference of Cane Pest and Disease Control Boards, while the Sugar Technologists Conference was attended by the millowners representative. One of the four Board meetings was held at Bundaberg immediately preceding the annual field day at that Station.

The two high production years 1953-54 and 1954-55 were responsible for the Board's funds being buoyant, and made possible the creation of a building reserve fund to cover future requirements in Brisbane. The financial position towards the end of 1954-55 also allowed a 25 per cent. reduction in assessment, setting the figure for the 1955 crop at threepence per ton of cane.

From time to time discussions with University authorities took place on the future of the Post Graduate Course in Sugar Technology. The very poor response from Applied Science and Chemical Engineering graduates prompted these discussions, and the University ultimately agreed to certain proposals made by the Board. These provided, *inter alia*, for the Post Graduate Course to be accepted as one of the requirements for attainment to a master's degree, and also for pure science students, under certain conditions, to be eligible to enter the post graduate year for a course with a chemical bias.

The Board, in furtherance of its previously announced policy, approved the overseas visits of the Senior Plant Breeder and the Senior Pathologist. The former visited cane breeding establishments in Philippines, India, Mauritius and Natal, while the latter left Australia in May, 1955, to confer with pathology research workers in England, Europe, Canada and the United States.

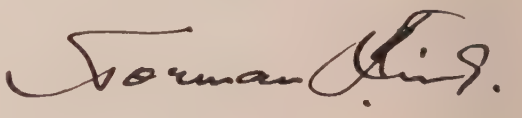
In regard to the Ninth Congress of the International Society of Sugar Cane Technologists, to be held in India during January-February, 1956, the Board approved that the Bureau be represented by the Director (who is General Vice-Chairman of the Congress) and the Chief Technologist (Engineer). It was further agreed, after consultation with the two sugar organizations which they represent on the Board, that the two industry representatives would also attend the Congress.

Extensive alteration and additions were made to a building on Meringa Station to relieve the overcrowding in the main office-laboratory. The cane breeding and entomology staff now occupy the remodelled building.

Negotiations for a new Brisbane building to house head office staff and certain other sugar organizations progressed but slowly during the year. The Government agreed in principle to the leasing of certain Crown land for the purpose but, to date, the matter is not sufficiently clarified to have advanced to the stage of a lease being granted. In the meantime the accommodation position at Head Office is becoming more acute.

Staff accessions during the period under review were more favourable than for many years and the Board has attempted to gain even more recruits for certain divisions of the Bureau. An effort is also being made to acquire more land adjacent to Meringa Station for expansion of cane breeding work.

Yours faithfully,



Director.

## APPENDIX I

*"The Sugar Experiment Stations Acts, 1900 to 1954"*

Statement of Receipts and Disbursements of Funds of the Sugar Experiment Stations Board for period 1st July, 1954, to 30th June, 1955.

| Receipts | £ | s. | d. | Disbursements | £ | s. | d. |
|---|---|---|---|---|---|---|---|
| Balance, 1/7/54 | 15,432 | 7 | 0 | Salaries | 56,908 | 9 | 4 |
| Assessment | 164,441 | 13 | 11 | General | 42,522 | 9 | 9 |
| Government Subsidy | 7,000 | 0 | 0 | Ayr | 4,496 | 12 | 1 |
| Ayr | 5,411 | 19 | 7 | Bundaberg | 5,218 | 2 | 2 |
| Bundaberg | 4,357 | 2 | 7 | Mackay | 5,671 | 9 | 6 |
| Mackay | 3,570 | 15 | 9 | Meringa | 8,591 | 7 | 8 |
| Meringa | 3,114 | 2 | 5 | Investment: | | | |
| Sundries | 7,117 | 11 | 1 | Building Fund Reserve | 30,000 | 0 | 0 |
| | | | | General Reserve | 45,000 | 0 | 0 |
| | | | | | £198,408 | 10 | 6 |
| | | | | Balance, 30/6/55 | 12,037 | 1 | 10 |
| | £210,445 | 12 | 4 | | £210,445 | 12 | 4 |

## Appendix II

### C.C.S. Formula

$$\text{C.C.S. in cane} = \text{Pol in cane} - \frac{\text{Soluble impurities in cane}}{2}$$

In practice, per cent. C.C.S. is calculated by the empirical formula—

$$\text{C.C.S.} = \frac{3P}{2}\left(1-\frac{5+F}{100}\right)-\frac{B}{2}\left(1-\frac{3+F}{100}\right)$$

where—

P = pol per cent first expressed juice.
B = brix per cent first expressed juice.
F = fibre per cent cane.

### Sugar Values, 1954 Season

The final prices for the 1954 Season's sugar have been declared as follows:—

| | No. 1 Pool | | | No. 2 Pool | Total |
|---|---|---|---|---|---|
| | Home Consumption | Surplus | Total | Excess | |
| Tons | 516,393 | 640,746 | 1,157,139 | 143,705 | *1,300,844 |
| Per cent. | 44·6267 | 55·3733 | 100 | — | — |
| Price | £47 1 0 | £38 16 6 | £42 9 11 | £31 1 0 | £41 4 7 |

* Excludes local sales.

In addition the value for New South Wales production was:—

| | Home Consumption | Surplus | Total |
|---|---|---|---|
| Tons | 26,290 | — | 26,290 |
| Per cent. | 100 | — | — |
| Price | £47 1 0 | — | £47 1 0 |

## Table I
## Sugar Cane Harvested, 1954—Estimated, 1955

| Domestic Tonnages | Actual Tonnages | | Mills | Estimated, 1955 (May estimate) |
|---|---|---|---|---|
| | Accepted | Condemned | | |
| 257,109 | 257,109 | 228 | Mossman | 236,000 |
| 390,574 | 390,574 | 310 | Hambledon | 312,000 |
| 384,782 | 384,782 | 590 | Mulgrave | 344,225 |
| 354,969 | 354,969 | — | Babinda | 354,630 |
| 318,870 | 318,870 | 254 | Goondi | 295,000 |
| 288,324 | 288,324 | 99 | Mourilyan | 269,000 |
| 430,964 | 430,964 | — | South Johnstone | 380,000 |
| 437,927 | 437,927 | 601 | Tully | 400,000 |
| 652,454 | 687,268 | 431 | Victoria | 599,000 |
| 404,649 | 392,640 | 235 | Macknade | 373,000 |
| 3,920,622 | 3,943,427 | 2,748 | | 3,562,855 |
| 207,169 | 184,366 | 14 | Invicta | 227,000 |
| 403,808 | 403,808 | 19 | Pioneer | 349,140 |
| 401,868 | 401,868 | 17 | Kalamia | 354,400 |
| 513,116 | 513,114 | 71 | Inkerman | 450,000 |
| 1,525,961 | 1,503,156 | 121 | | 1,380,540 |
| 382,115 | 382,115 | 31 | Proserpine | 340,000 |
| 381,539 | 381,529 | 37 | Farleigh | 350,000 |
| 372,748 | 373,123 | 157 | Racecourse | 398,927 |
| 376,713 | 376,460 | 17 | Pleystowe | 340,000 |
| 329,975 | 330,256 | 106 | Marian | 320,000 |
| 159,483 | 159,201 | 50 | Cattle Creek | 160,000 |
| 228,710 | 228,599 | 15 | North Eton | 220,000 |
| 385,336 | 385,336 | 50 | Plane Creek | 340,000 |
| 2,616,619 | 2,616,619 | 463 | | 2,468,927 |
| 304,015 | 304,460 | 108 | Fairymead | 300,000 |
| 143,344 | 143,468 | — | Qunaba | 157,000 |
| 317,690 | 316,786 | 27 | Millaquin | 270,000 |
| 328,654 | 328,989 | 5 | Bingera | 302,000 |
| 89,297 | 89,297 | 6 | Gin Gin | 100,000 |
| 319,380 | 319,380 | 5 | Isis | 390,900 |
| 128,581 | 128,581 | 26 | Maryborough | 120,000 |
| 142,993 | 142,993 | 9 | Moreton | 148,557 |
| 27,149 | 27,149 | — | Rocky Point | 30,000 |
| 1,801,103 | 1,801,103 | 186 | | 1,818,457 |
| 9,864,305 | 9,864,305 | 3,518 | | 9,230,779 |

## Table II
## Sugar Production (94 Net Titre), 1949-1954

| Districts | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 |
|---|---|---|---|---|---|---|
| North of Townsville | 345,684 | 344,944 | 304,786 | 421,921 | 467,716 | 502,276 |
| South of Townsville | 551,583 | 534,900 | 399,556 | 512,693 | 752,667 | 789,969 |
| Totals* | 897,267 | 879,844 | 704,342 | 934,614 | 1,220,383 | 1,301,245 |

* Local Sales included.

**Table III**

**Classes of Cane Harvested, 1954**

| Districts | Plant Cane | | Ratoons | | Standover | | Total Acres |
|---|---|---|---|---|---|---|---|
| | Acres | % | Acres | % | Acres | % | |
| Northern .. .. | 44,502 | 33·3 | 88,803 | 66·6 | 98 | 0·1 | 133,403 |
| Burdekin .. .. | 22,625 | 58·0 | 15,965 | 41·0 | 382 | 1·0 | 38,972 |
| Mackay .. .. | 56,502 | 45·2 | 68,523 | 54·8 | 34 | — | 125,059 |
| Southern .. .. | 20,694 | 29·5 | 42,176 | 60·1 | 7,336 | 10·4 | 70,206 |
| Whole State .. | 144,323 | 39·3 | 215,467 | 58·6 | 7,850 | 2·1 | 367,640 |

**Table IV**

**Total and Average Yields by Districts, 1954**

| Districts | Tons of Cane | Tons Cane per Acre | Tons 94 N.T. Sugar per Acre |
|---|---|---|---|
| Mossman-Ingham .. .. .. .. | 3,920,622 | 29·39 | 3·74 |
| Lower Burdekin .. .. .. .. | 1,525,961 | 39·16 | 5·68 |
| Proserpine .. .. .. .. | 382,115 | 20·30 | 2·66 |
| Mackay .. .. .. .. .. | 2,234,504 | 21·03 | 2·84 |
| Bundaberg-Gin Gin .. .. .. .. | 1,183,000 | 26·65 | 3·35 |
| Childers-Maryborough .. .. .. | 447,961 | 24·45 | 3·15 |
| Nambour-Beenleigh .. .. .. .. | 170,142 | 22·69 | 2·91 |
| Whole State .. .. .. .. | 9,864,305 | 26·83 | 3·54 |

**Table V**

**Acres Cultivated and Harvested, Yields of Cane and Sugar, Acre Yields and Quality of Cane, 1945-1954**

| Year | Acres* Cultivated | Acres Harvested for Milling | Total Yields | | Yields per Acre | | Tons Cane per ton Sugar |
|---|---|---|---|---|---|---|---|
| | | | Cane | Sugar | Cane | Sugar | |
| 1945 .. .. | 326,247 | 239,826 | 4,551,982 | 644,661 | 18·98 | 2·69 | 7·06 |
| 1946 .. .. | 317,766 | 228,395 | 3,714,475 | 512,086 | 16·26 | 2·24 | 7·25 |
| 1947 .. .. | 332,516 | 220,649 | 4,150,987 | †571,658 | 18·81 | 2·59 | 7·26 |
| 1948 .. .. | 384,213 | 258,585 | 6,433,556 | †910,049 | 24·88 | 3·52 | 7·07 |
| 1949 .. .. | 395,660 | 275,313 | 6,518,021 | †897,267 | 23·67 | 3·26 | 7·26 |
| 1950 .. .. | 381,545 | 257,562 | 6,691,706 | †879,844 | 25·98 | 3·42 | 7·61 |
| 1951 .. .. | 388,348 | 273,371 | 5,005,172 | †704,342 | 18·31 | 2·58 | 7·11 |
| 1952 .. .. | 419,834 | 274,757 | 6,841,536 | †934,614 | 24·90 | 3·40 | 7·32 |
| 1953 .. .. | 466,484 | 332,703 | 8,751,063 | †1,220,383 | 26·30 | 3·67 | 7·17 |
| 1954 .. .. | — | 367,640 | 9,864,305 | †1,301,245 | 26·83 | 3·54 | 7·58 |
| Averages .. | — | 272,881 | 6,252,281 | 857,615 | 22·91 | 3·09 | 7·27 |

* Supplied by Government Statistician. † Includes Local Sales.

**Table VI**

**† Details of Molasses Disposals for Periods 1945-1954**

| Usage | Tons of Molasses | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 |
| Distilleries .. | 61,307 | 69,842 | 54,014 | 119,615 | 115,376 | 99,940 | 79,063 | 99,410 | 154,152 | 153,212 |
| Fertilizer .. .. | 20,095 | 18,938 | 23,276 | 34,655 | 49,293 | 36,446 | 34,529 | 47,260 | 75,781 | 69,446 |
| Stock Feed .. | 30,559 | 45,288 | 34,808 | 38,349 | 36,479 | 36,621 | 37,151 | 37,099 | 36,263 | 38,046 |
| Mill Fuel .. .. | 11,426 | 6,238 | 9,340 | 11,003 | 9,771 | 15,556 | 6,327 | 5,882 | 1,211 | 7,140 |
| *Ferment .. .. | — | — | — | 2,479 | 3,561 | 3,582 | 2,033 | 2,532 | 3,196 | 2,779 |
| Other Purposes .. | 2,765 | 1,575 | 2,047 | 161 | 1,204 | 231 | 9 | 151 | 217 | 352 |
| Wasted .. .. | 333 | 415 | 99 | 1,099 | 1,858 | 325 | 235 | 482 | 1,111 | 1,544 |
| Totals .. .. | 126,485 | 142,296 | 123,584 | 207,361 | 217,542 | 192,701 | 159,347 | 192,816 | 271,931 | 272,519 |

* Prior to 1948, Molasses used for cleaning ferment was included with that shown under heading "Other Purposes".
† Supplied by Government Statistician.

## Table A

**Summary of production and consumption figures and sugar values for ten years**

| Year | Total Sugar Production at 94 n.t.* | Total Sugar Exported at 94 n.t. | Average Australian Price | Average Export Price | Average Price No. 1 Pool Sugar | Average Price all Sugar | Total Value |
|---|---|---|---|---|---|---|---|
| | | | £ s. d. | £ s. d. | £ s. d. | £ s. d. | £ |
| 1945.. .. | 644,624 | 205,453 | 21 18 0 | 16 17 9 | 20 8 2 | 20 6 1 | 13,087,000 |
| 1946.. .. | 512,035 | 72,578 | 21 18 0 | 21 10 0 | 21 16 11 | 21 16 10 | 11,184,000 |
| 1947.. .. | 571,503 | 95,246 | 24 0 0 | 29 12 6 | 24 16 0 | 24 18 9 | 14,251,000 |
| 1948.. .. | 909,896 | 440,814 | 23 1 0 | 28 2 0 | 24 17 0 | 25 9 11 | 23,198,000 |
| 1949.. .. | 896,236 | 431,254 | 24 6 0 | 29 7 6 | 26 9 3 | 26 14 10 | 23,967,000 |
| 1950.. .. | 879,689 | 395,151 | 24 11 0 | 32 16 6 | 28 4 1 | 28 5 4 | 24,866,000 |
| 1951.. .. | 704,043 | 154,486 | 33 14 0 | 36 15 6 | 34 7 4 | 34 7 6 | 24,201,478 |
| 1952.. .. | 934,226 | 471,008 | 44 3 0 | 41 2 0 | 42 14 2 | 42 12 3 | 39,809,705 |
| 1953.. .. | 1,220,025 | 730,566 | 47 18 6 | 39 18 0 | 43 8 3 | 42 7 11 | 51,723,936 |
| 1954.. .. | 1,300,844 | 784,451 | 47 1 0 | 37 8 0 | 42 9 11 | 41 4 7 | 53,632,714 |

* Excluding Local Sales.

## Table B

**Table of Mill Peaks (Tons of 94 n.t. Sugar)**

| Mill | 1929 | 1939 | 1949† | 1950† | 1952 | 1953 | 1954 | Best Year's Output |
|---|---|---|---|---|---|---|---|---|
| Mossman .. .. | 14,972 | 20,000 | 22,000 | 22,000 | 24,000 | 31,000 | 31,000 | 32,102 |
| Hambledon .. | 31,836 | 36,000 | 39,600 | 39,600 | 41,000 | 44,000 | 44,000 | 52,298 |
| Mulgrave .. .. | 31,643 | 36,000 | 40,100 | 40,100 | 40,500 | 47,500 | 47,500 | 49,710 |
| Babinda .. .. | 31,901 | 36,000 | 39,600 | 39,600 | 42,500 | 46,000 | 46,400 | 42,070 |
| Goondi .. .. | 27,034 | 29,500 | 32,400 | 32,400 | 34,500 | 38,000 | 38,000 | 39,243 |
| South Johnstone .. | 30,979 | 36,000 | 39,600 | 39,600 | 42,500 | 47,000 | 47,000 | 53,542 |
| Mourilyan .. | 23,630 | 27,000 | 29,700 | 29,700 | 31,000 | 34,000 | 34,000 | 35,412 |
| Tully .. .. | 30,930 | 38,000 | 42,100 | 42,100 | 45,000 | 47,000 | 47,000 | 54,755 |
| Macknade .. | 30,952 | 34,000 | 39,900 | 46,500 | 48,500 | 52,000 | 52,000 | 54,295 |
| Victoria .. .. | 32,221 | 37,500 | 43,600 | 49,100 | 52,000 | 78,000 | 82,000 | 89,353 |
| Invicta .. .. | 11,736 | 16,000 | 18,300 | 19,100 | 20,500 | 30,000 | 30,000 | 25,598 |
| Kalamia .. .. | 26,053 | 31,000 | 35,400 | 35,600 | 38,000 | 48,000 | 48,000 | 59,698 |
| Pioneer .. .. | 21,391 | 26,000 | 30,100 | 34,000 | 35,500 | 45,000 | 45,000 | 59,045 |
| Inkerman .. .. | *24,207 | 31,000 | 36,800 | 42,000 | 45,000 | 55,000 | 55,000 | 74,156 |
| Proserpine .. | 16,650 | 23,000 | 26,300 | 33,000 | 35,000 | 43,000 | 43,000 | 53,323 |
| Farleigh .. .. | 16,993 | 23,000 | 27,600 | 32,400 | 33,500 | 42,000 | 42,000 | 52,499 |
| Racecourse .. | 18,066 | 24,000 | 29,000 | 35,200 | 36,500 | 42,000 | 42,000 | 50,175 |
| Pleystowe .. .. | 19,781 | 24,000 | 29,200 | 35,900 | 37,000 | 45,000 | 45,000 | 52,922 |
| Marian .. .. | 18,997 | 24,000 | 28,600 | 32,300 | 33,500 | 42,000 | 42,000 | 47,981 |
| North Eton .. | 9,319 | 12,000 | 14,500 | 15,900 | 17,500 | 26,000 | 26,000 | 31,511 |
| Cattle Creek .. | 8,791 | 12,000 | 13,400 | 14,100 | 14,500 | 20,000 | 20,000 | 21,758 |
| Plane Creek .. | 18,233 | 24,000 | 28,600 | 30,800 | 32,500 | 42,000 | 42,000 | 53,531 |
| Fairymead .. | 15,882 | 21,000 | 25,700 | 28,600 | 29,500 | 37,000 | 37,500 | 37,740 |
| Qunaba .. .. | 8,940 | 10,000 | 11,200 | 12,700 | 13,500 | 15,500 | 16,500 | 18,135 |
| Millaquin .. | 14,443 | 19,000 | 24,100 | 29,600 | 31,000 | 35,000 | 39,000 | 40,429 |
| Bingera .. .. | 17,864 | 23,000 | 27,800 | 31,000 | 31,500 | 37,000 | 37,000 | 41,808 |
| Gin Gin .. .. | 6,000 | 6,500 | 8,000 | 8,400 | 9,000 | 12,500 | 13,000 | 10,503 |
| Isis .. .. .. | 28,011 | 27,000 | 30,000 | 30,200 | 31,500 | 33,000 | 35,000 | 41,325 |
| Maryborough .. | 3,862 | 7,500 | 9,500 | 9,500 | ‡17,300 | 14,500 | 20,000 | 16,378 |
| Mount Bauple .. | 6,231 | 6,500 | 7,200 | 7,200 | — | — | — | — |
| Moreton .. .. | 11,586 | 14,000 | 16,000 | 16,000 | 16,500 | 20,000 | 20,000 | 18.644 |
| Eagleby .. .. | 280 | 300 | — | — | — | — | — | — |
| Rocky Point .. | 2,014 | 2,200 | 2,700 | 2,700 | 2,780 | 3,500 | 4,000 | 3,117 |
| | 611,428 | 737,000 | 848,600 | 916,900 | 963,080 | 1,152,500 | 1,170,900 | — |

* Increased by 2,500 tons in 1938.
† Does not include 3 per cent. for Soldiers' Settlement.
‡ Includes 4,800 tons for Mt. Bauple.

# Division of Soils and Agriculture

(L. G. Vallance, Assistant Director)

## ANALYTICAL WORK

### Increased Number of Soil Samples

The Brisbane Laboratory handled an increased number of advisory soil samples during the year and 1,382 samples taken from farm properties were analysed. Advice regarding the correct type and amount of fertilizer required, together with a recommendation for liming where necessary, was forwarded to each of the growers concerned. Of these soil samples 389 (nearly one-third of the total number from all districts) were forwarded from the Ingham area. The interest taken by the Ingham growers in this phase of the Bureau's activities is most pleasing and reflects the value of the recently established office in that centre.

### Emphasis on Potash Deficiency

The accompanying table shows the number of soils received from the various districts and also the percentage with low, fair and good contents of available phosphate and potash. As with previous years, the emphasis is again on a deficiency of potash rather than of phosphate. The high degree of fertility of the Lower Burdekin (Ayr) soils is still evident.

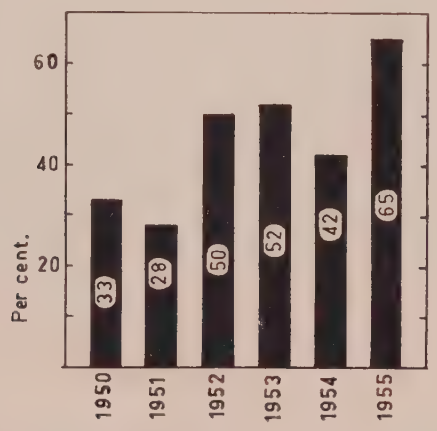
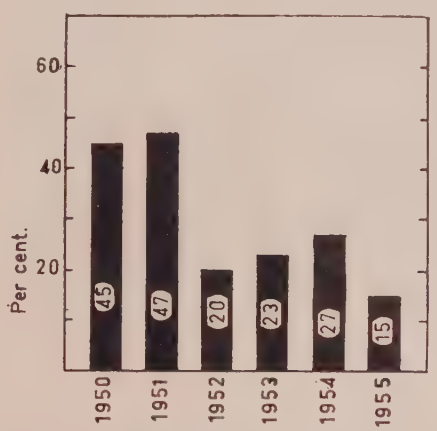



Fig. 7—Percentage soils low in potash.




Percentage soils high in potash.

**The changing potash status of Mossman-Babinda soils over a six-year period.**

| District | Phosphate | | | Potash | | | No. of Samples |
|---|---|---|---|---|---|---|---|
| | Low | Fair | Good | Low | Fair | Good | |
| | % | % | % | % | % | % | |
| Mossman-Babinda .. .. | 31 | 10 | 59 | 65 | 20 | 15 | 198 |
| Innisfail .. .. .. | 34 | 9 | 57 | 64 | 18 | 18 | 102 |
| Ingham .. .. .. .. | 31 | 20 | 49 | 32 | 35 | 33 | 389 |
| Ayr .. .. .. .. | 10 | 6 | 84 | 8 | 20 | 72 | 61 |
| Mackay .. .. .. .. | 50 | 17 | 33 | 73 | 16 | 11 | 337 |
| Bundaberg .. .. .. | 54 | 18 | 28 | 60 | 16 | 24 | 230 |
| Southern .. .. .. | 37 | 25 | 38 | 32 | 25 | 43 | 65 |
| Totals .. .. .. | 39 | 16 | 45 | 53 | 22 | 25 | 1382 |

### R.s.d. Virus not Detected with Spectrophotometer

Juice from cane affected with ratoon stunting disease was examined with a Uvispek spectrophotometer. Considerable time was spent in trying various methods of extracting the virus from diseased juice. The solutions were critically examined in the region of 260 millimicrons, but no measurable light absorption due to the presence of nucleic acid was found. This again emphasises the difficulty of isolating and concentrating the causative agent of r.s.d. sufficiently for laboratory detection.

### Amino-acid Content of Stalk and Leaf Extracts

Evidence appears to be accumulating that the presence of various amino bodies may adversely affect the recovery of sugar during milling operations. Methods of determining the presence of these compounds in the juice extracts of stalks and leaves were therefore studied. By means of paper chromatography and using a two dimensional ascending technique the following compounds were detected in the variety Q.28—aspartic acid, asparagine, glutamic acid, glycine, alanine and/or tyrosine, valine, leucine (or isomer) glutamine and $\gamma$-amino-butyric acid. Both the stalk and leaf extracts gave similar chromatograms although the results were more pronounced in the latter.

### Effect of Boron on Sucrose Content

Since boron appears to have an important influence on the rate of translocation of sugars from the leaves to the stems of plants, experiments have been initiated to determine the effect of the application of this minor element on the sucrose content of the cane stalk. A satisfactory method for the micro-determination of sugars was developed and determinations were made on the leaves, leaf sheafs and stalks of young cane grown in a preliminary series of pot experiments. However, up to the age of six months no differences due to boron treatment could be detected. At this stage the pot trial was discontinued and the work transferred to a field trial now in progress. In this latter trial boron has been combined with 2,4-D and both are used in the form of foliar sprays and soil applications.

### Total Carbon in Soil Not Increased

Total carbon determinations were carried out on soil samples from the 32 plots of the permanent trash trial on Bundaberg Experiment Station. This trial was first planted in 1933 and has grown cane continuously since that date. Fourteen crops have now been harvested and, on some plots, all the trash and tops have been conserved and returned to the soil. On the others the cane has been burnt in the usual way.

These analytical results showed no significant difference in the total carbon content of the soil samples taken from the two treatments.

## FERTILIZER TRIALS

### Well-defined Response to Nitrogen and Potash

The number of fertilizer trials harvested on farmer's properties was the lowest for many years. This was due to the concentration of the field staff on the ratoon stunting disease control programme. However, five trials were harvested and the responses were similar to the general trends which have been evident over recent years, *i.e.*, sulphate of ammonia and muriate of potash were beneficial but no definite response to superphosphate was obtained.

### Molasses Improved Soil Tilth and Cane Tonnage

In some parts of the Mackay district there occur areas of grey soils which are heavy in texture and overlie a yellow clay subsoil at a shallow depth. These fields are very sensitive to weather conditions and set very hard and dry in the dry weather, but are wet and waterlogged in the rainy season. Some varieties of cane, because of their capacity to tolerate such conditions, frequently produce a reasonable crop. However, in most years patches of very poor growth will occur and a number of stools may die.

On these poor patches a series of trials (commenced in 1952) was completed during the year. The following materials were applied, both singly and in various combinations:—copper, zinc, molybdenum, boron, manganese, cobalt, sulphur, gypsum, lime, mill muds and molasses. Adequate amounts of nitrogen, phosphoric acid and potash were also used.

The response to molasses was highly significant but no other treatment had any beneficial effect. The reason for the increased production on the molasses plots was undoubtedly due to the improvement in soil physical condition. The tilth of the molasses treated plots was distinctly better than that of the others. It is of interest to record that no improvement in this respect from the applications of gypsum, lime, sulphur or mill muds could be observed.

## SOME FIELD STUDIES WITH 2,4-D

### Foliar Spray with 2,4-D Again Fails to Increase Sugar Content

It was reported last year that a trial in the Mackay district had failed to show any increase in c.c.s. due to foliar application of 2,4-D. This result was again experienced in a randomised trial conducted at South Kalkie, Bundaberg. In this instance the ethyl ester of 2,4-D was used. It

**Fig. 8—Giant sensitive plant has covered a crop of Badila which would have yielded 30 tons per acre. The pest smothers and flattens the cane crop and renders the land useless.**

**Fig. 9—Another view of the giant sensitive plant invading rich cane land and ruining the crop.**

**Fig. 10—Coastal fattening land on which the grass is entirely covered with giant sensitive plant.**

**Fig. 11—Invasion of cattle fattening country by giant sensitive plant in the Innisfail area.**

was applied to the variety Q.47 during the last week in August. Four days later comparative c.c.s. tests were made and these were continued twice weekly for a three week period.

There were no significant differences between the c.c.s. values of the plots sprayed with 2,4-D at various levels and those of the plots which were sprayed with water alone.

### Loss of 2,4-D by Leaching

Some breakdowns in pre-emergence weed control with the sodium salt of 2,4-D have been reported. Investigations were commenced to study the retention of this weedicide in the surface horizon of several soil types. It was found that on some of the reddish, light, sandy soils in the Bundaberg area two inches of rainfall would remove a considerable amount of 2,4-D sodium salt from the surface where it had been applied. On the other hand, a silty loam from Eight Mile Plains was able to retain almost the whole of the 2,4-D applications in the top inch of the soil. The rate of movement of the weedicide seemed independent of whether the formulation contained a wetting agent.

## IRRIGATION INVESTIGATIONS

Soil moisture studies are in progress on the irrigated lands surrounding the Lower Burdekin Sugar Experiment Station. In order to obtain some preliminary information regarding the moisture content of the various soils cultivated to cane, regular moisture determinations were made at several sites to a depth of five feet. The year, however, was a very wet one and the soils were at field capacity moisture content for most of the time.

Measurements made on the drying-out characteristics of the soil on the Experiment Station are of interest and these are shown diagrammatically in Fig. 12. At this site a dry period occurred towards the end of March and extended into the fourth week of April. The moisture content of the surface six inches of soil fell from 25.4 per cent. to 8.6 per cent. There was not a great deal of loss in the second foot of soil, but the loss in the third foot was practically equal to that near the surface.

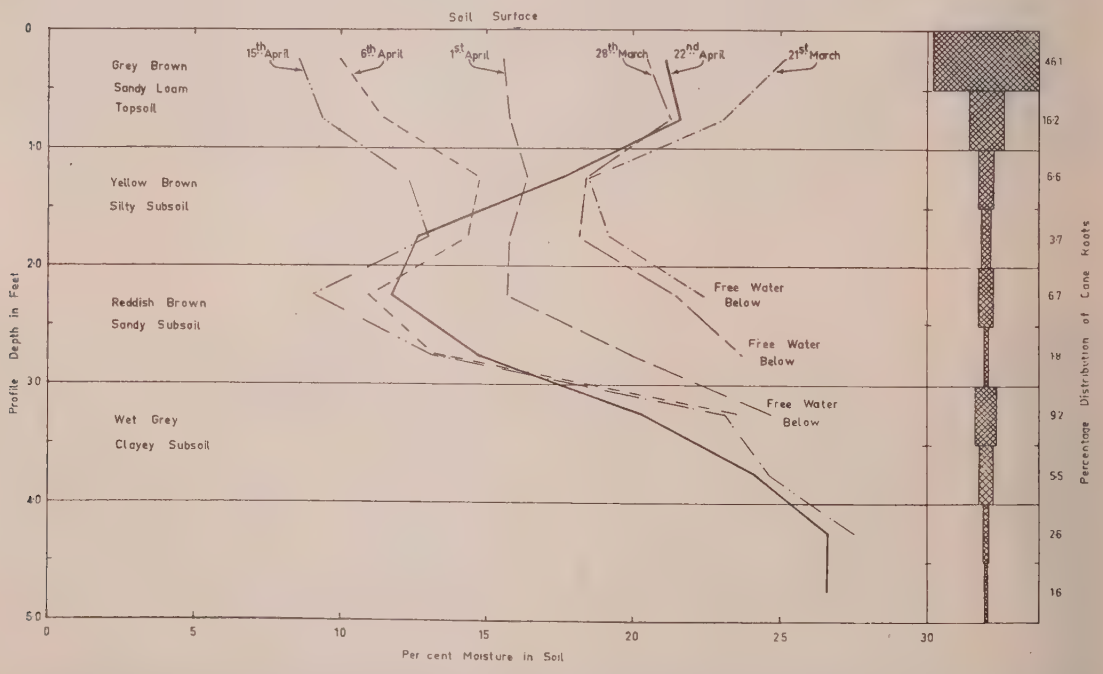



**Fig. 12—Showing the degree to which the soil dried out during the period 21st March to 15th April. When irrigated on the 22nd April the soil moisture at the various depths was replenished to the percentages indicated by the heavy unbroken line. On the right of the diagram is shown the amount of cane roots present at different depths in the soil.**

This 2-3 foot horizon consisted of coarse sandy material and the water loss was undoubtedly due to drainage. The grey clayey subsoil below about three feet remained very wet throughout.

The field was irrigated on the 23rd April and the soil was wetted to the percentages and depths shown by the heavy unbroken line. This single irrigation replenished the soil moisture to approximately the level prevailing just after the wet season had terminated.

### Cane Root Distribution

Fig. 12 also shows the percentage distribution of cane roots in the various levels at the site of the soil moisture determinations. The diagram shows that the greater proportions of the roots were concentrated in the top six inches of the soil. The root distribution fell very sharply at soil depths below one foot.

## SOIL CONSERVATION

### Legumes used in Erosion Control Experiment

On a trial block in the Isis area, cane was successfully planted through a leguminous cover crop of Reeves Selection cowpea. The site was a hillside on which the slope varied from one to 15 per cent. This type of country is subject to erosion, particularly in the late summer months when the land is in the loose and well cultivated condition usually required for planting. The cover crop was planted in November and this protected the soil until the vulnerable period of summer

**Fig. 14—A Childers cane field on which planting was performed through the green manure crop in February.**

**Fig. 13—The cane planter operating through the legume crop.**

**Fig. 15—The same field in July. The legume residues have disappeared, but the land was protected from erosion during the wet months.**

rains had passed. It was possible to operate the cutter-planter and plant the cane satisfactorily through the legume without a great deal of difficulty. A cyclone ushered in a wet period towards the end of March, bringing 22 inches of rain, but the loss of soil was very slight.

The nature of this planting method is indicated in Figs. 13, 14 and 15.

A close liaison was maintained with the Soil Conservation Section of the Department of Agriculture and Stock and, in the Mackay district at West Plane Creek and Kuttabul, Bureau officers have assisted in the laying out of erosion control schemes on several farms. These control methods proved very effective against the heavy monsoonal rains which occurred this year and it is hoped that the beneficial results obtained will encourage more growers to adopt similar practices.

## WEEDICIDES

Experimental work with weedicides was mainly confined to that carried out on the various Experiment Stations and the details are therefore given in other sections of this Report. However, further work was done on the problem of controlling weeds in irrigation channels in the Lower Burdekin district. Two boron compounds were used, namely, Polybor-chlorate and Borascu. The former has given very satisfactory control of grass and weeds when used at the rate of 15 lb. per 100 sq. feet. The treated areas have remained clean for periods of five to eight months, during which time some 40 inches of rain were recorded. Borascu was generally unsatisfactory as was A.K. 100, which was also tried.

**Fig. 16—Nut grass control with maleic hydrazide. Note heavy nut grass growth on the unsprayed section on the left. Section on right was sprayed with 1.6 per cent. solution in April, 1955. Photograph was taken a month later.**

# Northern Sugar Experiment Station

(G. Bates, Officer in Charge)

### Weather and Crop Notes

Soil moisture conditions at the beginning of the 1954-55 year were adequate for the young crops. Winter temperatures were normal and the July-September rainfall slightly above average, useful rains having fallen in August. Above average registrations in October gave the crop a good start which was checked in November. Then followed an abnormally dry January, when rainfall totalled 2.89 inches, compared with an average of 15.96 inches, and this delay in the commencement of the wet season gave the crop a severe check. In February was recorded an unprecedented precipitation of 50.06 inches, rain falling on every day of the month. Rainfall for March-May inclusive was well above that usually experienced. Although the record rainfall in February caused local flooding, little damage was reported. The wet season passed without any cyclonic weather, although heavy winds in April caused lodging in a few areas.

### 1954 Plantings and Germinations

Early plantings for the 1955 crop were delayed by rain in April, 1954, when 11.7 inches fell, so that the acreage planted in autumn was below average. Rain on 20 days in August interfered with spring planting, which was carried out generally later in the year than usual. Good rain in October kept the crop growing nicely until the dry spell in January.

**Fig. 17—The new plant breeding and entomological laboratories on Meringa Station.**

Germinations were good, due to adequate soil moisture and the use of mercurial dips—a practice that is now standard on a large proportion of farms. Canes hot-water treated for a control of ratoon stunting disease gave much better germination than in the previous year, due mainly to the use of wire baskets as containers in place of bags; this greatly reduced the damage to eyes.

One feature of the 1955 crop is the reduced amount of fertilizer used per acre. In one mill area an average drop of 50 per cent. was recorded.

### 1954 Harvest

The 1954 harvest was one of the most difficult that growers have faced. Rain fell at inconvenient times and a shortage of cane cutters, combined with inexperienced labour and lodged crops, contributed to abnormally high harvesting costs.

### Pests

Greyback grubs did very little damage due to infestations being light and to the widespread use of BHC. Frenchi grubs, however, did cause some noticeable damage in ratoons and in a smaller area of plant cane in both Mossman and Mulgrave districts.

A swarm of the spur-throated locust passed through the Bartle Frere-Mirriwinni area late in 1954, but these adults and the young hoppers which emerged in December did but slight damage.

Rat damage has increased noticeably as compared with recent years.

### 1955 Planting Conditions

Rainfall during the year 1954-1955 was 99.81 inches, compared with the 31-year average of 74.89 inches. May rainfall was 6.43 inches, compared with an average of 2.54 inches, and this caused a delay in land preparation and planting operations, particularly in the wetter areas, so that the acreage of autumn planted cane for the 1956 season is well below normal. In addition to the heavier rainfall, the first six months of 1955 showed a very much reduced average daily hours of sunshine compared with 1954. This, with continued wet weather, has resulted in low c.c.s. values being recorded by northern mills at the commencement of the 1955 crushing.

The following tables show the rainfall records taken at the Northern Sugar Experiment Station over the past 31 years and include details of other meteorological observations.

**Rainfall Records, 1914-1955**

| Year | Rainfall in Inches | Year | Rainfall in Inches |
|---|---|---|---|
| 1924–25 | 82.86 | 1940–41 | 80.59 |
| 1925–26 | 49.02 | 1941–42 | 41.55 |
| 1926–27 | 80.34 | 1942–43 | 64.60 |
| 1927–28 | 72.46 | 1943–44 | 52.92 |
| 1928–29 | 92.83 | 1944–45 | 120.34 |
| 1929–30 | 69.99 | 1945–46 | 63.95 |
| 1930–31 | 75.62 | 1946–47 | 35.24 |
| 1931–32 | 61.87 | 1947–48 | 69.12 |
| 1932–33 | 90.02 | 1948–49 | 85.77 |
| 1933–34 | 119.09 | 1949–50 | 83.50 |
| 1934–35 | 58.22 | 1950–51 | 67.68 |
| 1935–36 | 87.64 | 1951–52 | 52.86 |
| 1936–37 | 49.54 | 1952–53 | 83.98 |
| 1937–38 | 53.28 | 1953–54 | 68.15 |
| 1938–39 | 126.79 | 1954–55 | 99.81 |
| 1939–40 | 82.10 | | |

Average for 31 years = 74.89 inches.

**Fig. 18—Planting a randomised trial on Meringa, 1955.**

**Abstract of Meteorological Observations made at Northern Sugar Experiment Station, Gordonvale, from 1st July, 1954 to 30th June, 1955**

| Month | Rainfall in Inches | No. wet days | Shade Temperature | | | | | | Mean Diurnal Range | Mean Temp. 9 a.m. | Mean Per Cent. Relative Humidity | Average Daily Hours Sunshine |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Maximum | | | Minimum | | | | | | |
| | | | High | Low | Mean | High | Low | Mean | | | | |
| 1954 | | | | | | | | | | | | |
| July | 0·48 | 5 | 87 | 72 | 80·6 | 68 | 45 | 58·2 | 22·4 | 69·1 | 85 | 5 hrs. 36 mins. |
| Aug. | 2·66 | 20 | 85 | 72 | 79·63 | 68 | 50 | 62·09 | 17·5 | 70·72 | 85 | 4 hrs. 18 mins. |
| Sept. | 0·33 | 7 | 88·5 | 78 | 83·88 | 69 | 54 | 60·33 | 23·5 | 74·79 | 77 | 6 hrs. 36 mins. |
| Oct. | 4·40 | 18 | 91·5 | 75 | 85·06 | 72 | 59 | 66·32 | 18·7 | 76·41 | 86 | 5 hrs. 21 mins. |
| Nov. | 0·76 | 8 | 95 | 88 | 91·65 | 73 | 61·5 | 67·31 | 24·3 | 81·7 | 75 | 8 hrs. 36 mins. |
| Dec. | 2·67 | 12 | 95 | 86 | 89·64 | 75 | 64 | 69·14 | 20·5 | 81·17 | 78 | 6 hrs. 24 mins. |
| 1955 | | | | | | | | | | | | |
| Jan. | 2·89 | 11 | 97·5 | 88 | 93·08 | 76 | 65 | 70·7 | 22·3 | 82·3 | 83 | 7 hrs. 5 mins. |
| Feb. | 50·06 | 28 | 94 | 81 | 87·05 | 76 | 71 | 73·57 | 13·4 | 78·28 | 95 | 2 hrs. 21 mins. |
| Mar. | 19·85 | 17 | 98 | 82 | 90·03 | 83 | 65 | 72·96 | 17·0 | 79·4 | 91 | 4 hrs. 35 mins. |
| April | 6·38 | 20 | 91 | 80 | 86·4 | 73 | 61 | 67·7 | 18·7 | 76·5 | 95 | 6 hrs. 4 mins. |
| May | 6·43 | 11 | 92·5 | 69 | 84·87 | 74 | 54 | 65·86 | 19·0 | 73·83 | 72 | 5 hrs. 6 mins. |
| June | 2·90 | 15 | 85 | 70 | 79·5 | 70 | 56 | 63·06 | 16·4 | 71·05 | 90 | 3 hrs. 13 mins. |

## EXPERIMENT STATION OPERATIONS

### Seedling Raising and Selection

In conformity with usual practise fuzz was planted in the glasshouse in late July, resulting in an ultimate field planting in October of 9,466 original seedlings.

The field selection of the 1953 series seedlings enabled the planting out of 196 canes in 30-sett plots during early August. At the same time there were planted in the trial, in addition to the seedlings, the following varieties:—E.129, G.297, L.808, L.831, L.833, M.601, M.602, M.761, F.31-436, F.36-819, 45M.Q.2569, 45M.Q.3495, Q.56 and Q.58.

### Yield Observation Trial with Seedlings

Selections from the 30-sett plots of "M" series seedlings totalled 28 varieties and these were planted in a yield observation trial together with a comparative standard.

Four "K" seedlings were selected from the first ratoon yield observation trial, and were replanted in a Latin Square experiment with the commercial variety Pindar. A further seven seedlings possessing a high sugar content were planted out on good soil in a yield observation plot; these lastmentioned canes were planted in comparison with I.222, Q.57 and Badila.

### Seedling Work at Babinda

In continuation of the seedling planting and selection work at this "wet" sub-station 150 original seedlings were transferred from Meringa, and 51 selections from previous plantings were replanted in 30-sett plots. In addition there was set out a yield observation trial with "K", "L" and "N" seedlings, P.O.J.3016, Co.475 and Pindar.

### New Varieties Imported

Releases from the Brisbane quarantine house during the year which were planted at Meringa

**Fig. 19—Discing a crop of velvet beans prior to ploughing in—Meringa, 1955.**

Station included Azul (Peru), Lahina (Hawaii), B.45-151, B.47-44, and B.47-419 (Barbados), 40S.N.746, 51B.N.15801, 51B.N.15803, 51B.N. 15804, 51B.N.15805 and 51B.N.15806 (C.S.R. Co.), B.O.11, B.O.28, B.O.29, Co.313 and Co.513 (India), Cl.38-32, C.P.38/34, C.P.50/11 and F.36-771 (U.S.A.), E.P.C.39-375, E.P.C.39-383 (Colombia),

and 51-9002, 51-9011, 51-9035 and 51-9037 (Hawaii). These will be tested so that they may be assessed as breeding or commercial types.

### Experiments Harvested during the Year

Four seedling trials were harvested during the year. These consisted of a plant trial in the form of a randomised block, a first ratoon randomised block, a plant yield observation trial, and a ratoon yield observation trial.

In the plant randomised block the varieties Co.475, J.204, J.238, J.301 and J.330 were compared with Pindar, the trial being harvested at 13 months. Co.475, which produced 7.53 tons of sugar per acre, significantly exceeded all others at the one per cent. level, Pindar being next with 6.54 tons of sugar. Other yields were J.204, 4.65; J.238, 4.61; J.330, 4.12; and J.301, 4.06 tons of sugar per acre respectively.

**Fig. 20—A heavy crop of Q.57 at Meringa. This new variety promises to become a major cane in parts of the north.**

Co.475 produced excellent stooling with only an odd arrow. It stood erect on burning and harvested an average tonnage of 51.29. Unfortunately, in South Queensland, Co.475 has been found to be highly susceptible to red rot disease and if it shows the same trend in North Queensland it is doubtful if the variety could be grown commercially.

In the ratoon randomised block where I.213, I.216, I.252, J.211 and J.225 were compared with Pindar, the crop was harvested at 12 months; Pindar, with 5.81 tons of sugar per acre, significantly exceeded all others at the one per cent. level. The results follow those obtained in the plant crop. Taking the two crops into consideration the total amount of sugar per acre obtained was:—

| | |
|---|---|
| Pindar (standard) .. | 12.29 |
| I.216 .. .. .. | 10.77 |
| J.211 .. .. .. | 10.76 |
| I.213 .. .. .. | 9.53 |
| I.252 .. .. .. | 10.08 |
| J.225 .. .. .. | 8.79 |

In the plant yield observation trial, 28 "L" series seedlings, together with Mowbray Seedling No. 3, P.O.J.3016, 36S.N.4995 and 38S.N.473 were compared with Pindar. The crop was harvested at 12 months and it was found that all were inferior to Pindar.

In the first ratoon yield observation trial 37 "K" series seedlings were compared with Pindar. The general trend of most varieties was towards high sugar rather than vigour. Four varieties were transferred to a Latin Square trial, while others which showed very high sugar but low vigour were placed in a yield observation trial on good land.

### Ratoon Stunting Disease Investigations

During 1954 a time/temperature trial was laid out to obtain further information on ratoon stunting disease. Five varieties, Badila, I.222, I.235, Pindar and Trojan, were subjected to hot-water treatment for various times at different temperatures. Results have not yet been assessed but it is interesting to note the varietal reaction to heat treatment.

The following table shows the percentage germination obtained (100 setts per plot).

| Variety | 2 hrs. 50° C. | 2½ hrs. 50° C. | 3 hrs. 50° C. | 2 hrs. 51° C. | 1½ hrs. 52° C. | 2 hrs. 52° C. | 1½ hrs. 53° C. | Control |
|---|---|---|---|---|---|---|---|---|
| Pindar .. .. | 97 | 85 | 91 | 91 | 80 | 80 | 65 | 97 |
| I.222 .. .. | 80 | 75 | 70 | 84 | 66 | 47 | 12 | 98 |
| Badila .. .. | 70 | 75 | 67 | 55 | 55 | 43 | 12 | 95 |
| I.235 .. .. | 60 | 75 | 45 | 50 | 44 | 18 | 6 | 88 |
| Trojan .. .. | 77 | 62 | 61 | 27 | 41 | 12 | 4 | 90 |

**Fig. 21—A fine stand of Q.59 at Boogan in the Innisfail district with young Q.59 in the foreground. This new variety will go on the approved list next January.**

The trial was late-planted, during the last week in September, with good soil conditions and favourable temperatures.

### Control of Ratoon Stunting Disease and Hot-Water Treatment

Measures for the control of ratoon stunting disease are still being carried out, and during the 1954 planting season all cane planted on this station was hot-water treated for two hours at 50° C. prior to planting. Approximately 150 varieties were treated during the season and, contrary to the experience of the previous year, germination was excellent in all but three or four varieties. The treatment in wire cages in place of bags has prevented mechanical damage to cane eyes, resulting in better strikes.

### Legumes

There were certain legumes which showed promise in trials during 1953 and, as a result, further plantings were made in mid-October and early December of 1954. The varieties planted were:—C.P.I.9247, C.P.I.9248, C.P.I.11044 and C.P.I.12377, using Black Cowpea, Reeves Selection and Mung bean as standards. Planting was on rather clayey soil and C.P.I.11044 was outstanding, followed closely by C.P.I.12377. Both gave excellent cover and stood up to 50 inches of rain in February. Due to dry conditions in January, premature flowering took place but, with rain, growth set in again and both varieties were giving complete cover five months after planting. From observations it appears that both C.P.I.11044 and C.P.I.12377 would be useful cover crops in many sugar areas. In another planting 40 varieties of legumes were planted in an observation plot and further plantings are to be made of any that show promise.

**Fig. 22—The flooded condition of part of Meringa Station during the 1955 wet season.**

## Annual Field Day

The attendance at the 1955 Field Day was an all-time record, when 750 visitors attended. The large attendance was due in some degree to the extended wet season preventing farm operations at the period Field Day was held. Visitors were conducted over the station by members of the Bureau staff, who explained the work being performed. There was a large display of tractors and implements.

## Laboratory Work

The following is a summary of cane samples handled during the year:—

| | |
|---|---|
| Station and trial samples .. .. | 1,352 |
| Farmers' samples .. .. .. | 89 |
| | 1,441 |

## Summary of Crops Grown on the Station

| | | |
|---|---|---|
| Parent canes and trials .. .. | 543.235 | tons |
| Used and sold for plants and used as samples .. .. .. | 46.0 | ,, |
| Original seedlings .. .. .. | 94.845 | ,, |
| | 684.080 | ,, |
| Plant cane harvested for the mill, including that sold for plants through the mill .. .. .. | 435.920 | tons |
| Ratoon cane harvested for the mill | 207.160 | ,, |
| Plants for station and other experimental plantings . .. .. | 41.000 | ,, |
| | 684.080 | ,, |
| Area of plant cane harvested .. | 11.7 | acres |
| Area of ratoon cane harvested .. | 9.6 | ,, |
| | 21.3 | ,, |
| Average tons per acre .. .. | 32.11 | |

# Lower Burdekin Sugar Experiment Station

(G. A. CHRISTIE, Officer in Charge)

## Weather Conditions and their Effect on Crops in the District

Reference to the abstract of meteorological observations at the Lower Burdekin Sugar Experiment Station for the year July, 1954, to June, 1955, shows that temperatures and relative humidity followed the normal conditions obtaining in the district, but a marked increase in rainfall is apparent. The total of 64.57 inches of rain exceeds by over 50 per cent. the average annual rainfall for the district, while 93 wet days is far above that usually recorded in the Lower Burdekin. The latter half of 1954 provided 4.59 inches of rain, all of which came in light falls, which, while of little value to growing crops, caused practically no interruption to the harvest of cane for milling. Steady rain commenced during the last week of January, 1955, and was more or less continuous until the end of the third week of March. No exceptionally heavy falls were recorded, but it is noteworthy that during this period of eight weeks 43 wet days were experienced.

A heavy arrowing in most crops is probably associated with the long period of overcast weather, and it is anticipated that sugar content of crops for 1955 harvest may be lower than that usually found in the Burdekin area. With the prolonged wet weather, land preparation for 1955 autumn planting was delayed but, on most farms, planting was well under way in late April and throughout most of May; near the end of May exceptionally heavy rain occurred, yielding 14.86 inches in three wet days. The month's total of 15.53 inches on nine wet days has no equal in the previous 40 years, when the May average has been less than one inch, while the previous highest May rainfall of a little over 5½ inches was recorded some 35 years ago.

During the year no strong winds occurred in the monsoonal period, and until the heavy rains in May, practically all cane in the district was erect. Moderate to strong gusty wind accompanied the May rain, and it is estimated that at least one-quarter of the district's 1955 crop lodged overnight.

Newly planted fields suffered some erosion in the heavy May rain and, with saturated soil, germination failures would have occurred on most farms, if the pre-planting treatment of setts with fungicidal solution had not become an established routine operation on practically every Lower Burdekin cane farm.

An abstract of meteorological observations at this Station for the year 1st July, 1954, to 30th June, 1955, follows.

| Month | Rainfall (inches) | No. of wet days | Shade Temperature | | | | | | Mean Diurnal Range | Mean Temperature 9 a.m. | Mean per cent. Relative Humidity 9 a.m. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Maximum | | | Minimum | | | | | |
| | | | High | Low | Mean | High | Low | Mean | | | |
| 1954 | | | | | | | | | | | |
| July .. | ·53 | 2 | 82 | 64 | 78·8 | 60 | 42 | 52·3 | 26·5 | 65·8 | 72·8 |
| August .. | ·23 | 2 | 84 | 76 | 80·6 | 62 | 51 | 55·6 | 25·0 | 70·0 | 75·5 |
| September | ·10 | 2 | 86 | 79 | 82·6 | 66 | 48 | 57·0 | 25·6 | 74·6 | 68·1 |
| October .. | 1·86 | 7 | 90 | 74 | 84·5 | 72 | 56 | 64·5 | 20·0 | 78·5 | 79·4 |
| November | ·69 | 4 | 93 | 86 | 89·3 | 77 | 60 | 66·6 | 22·7 | 84·1 | 61·4 |
| December.. | 1·18 | 8 | 92 | 83 | 89·0 | 73 | 62 | 67·8 | 21·3 | 82·1 | 67·7 |
| 1955 | | | | | | | | | | | |
| January .. | 9·74 | 7 | 94 | 82 | 90·6 | 74 | 65 | 69·8 | 24·0 | 83·5 | 66·6 |
| February .. | 19·52 | 23 | 91 | 78 | 85·6 | 77 | 67 | 73·8 | 11·8 | 80·1 | 83·2 |
| March .. | 12·61 | 18 | 95 | 77 | 86·3 | 78 | 65 | 71·6 | 15·7 | 79·3 | 78·7 |
| April .. | 2·08 | 8 | 91 | 80 | 86·2 | 70 | 61 | 64·2 | 22·0 | 72·3 | 62·3 |
| May .. | 15·53 | 9 | 88 | 69 | 81·3 | 71 | 53 | 64·9 | 16·4 | 74·7 | 76·4 |
| June .. | ·50 | 3 | 87 | 70 | 77·6 | 61 | 48 | 56·4 | 21·2 | 67·0 | 75·6 |

### Insect and Animal Damage

Soil applications of BHC to prevent damage to cane by white grubs proved very successful during several past years, and the absence of damage may have caused some cane growers to think that protective measures were no longer necessary. As a result, a smaller section of the area normally subject to grub attack was treated with BHC and some damage is apparent in 1955 crops, though district losses from this pest will not be large. Rat damage in lodged cane is expected to be somewhat heavier than in recent years, though it is difficult to assess losses until the affected areas are harvested. The usual light damage by wallabies in cane areas adjacent to grazing land and by coots where fields are near watercourses and lagoons, is noted, while spot damage by termites can be detected on a few farms.

### Ratoon Stunting Disease

It has previously been recorded that a rapid propagation and distribution of cane from stocks of heat treated commercial varieties was undertaken by Cane Pest and Disease Control Boards in the Lower Burdekin and Giru areas. Unfortunately disease symptoms were located in some blocks of treated cane, though a complete re-treatment of all varieties is being undertaken to replace all previously treated cane. New treating units are being prepared by Lower Burdekin Cane Pest and Disease Control Boards and the Experiment Station unit has been modified to improve water circulation and heat transference to plants. District growers report more rapid germinations and early growth in cane from heat treated stocks when compared with untreated cane.

### Pineapple Disease

Pineapple disease, which until a few years ago caused germination failures on many Burdekin and Giru cane farms, is now virtually a disease of the past, since a very efficient control is obtained by the pre-planting treatment of plants with an organic mercurial solution. The stimulating effect and more rapid germination following treatment, even in areas not affected by the disease, are appreciated by all, and the treatment has now become a standard practice on almost every farm in the area.

### Other Diseases

A small number of stools of mosaic disease can still be located on a few farms, but a little more

**Fig. 23—Wind and rain damage in a heavy cane crop at Ayr in May, 1955.**

inspection work could eliminate this disease from the area. During the year a complaint of unknown origin was located in prominent varieties on at least three farms, and efforts to prevent its spread have been undertaken, while specimens were submitted for pathological investigation.

## EXPERIMENT STATION OPERATIONS

### Seedling Raising and Selection

Seedling raising and testing occupies a prominent part of Station work, and it is of interest that the first seedlings planted on this Station in 1950 have now passed through their progressive trials, two of them, L.423 and L.469, being released for planting on a few selected farms in the area. Their performance in these farm trials will be watched carefully and their suitability for the district will be assessed.

**Fig. 24 —The unseasonal heavy May rains caused the lodging of many crops in the Ayr district. The completely flat nature of many of the fields is shown in this illustration.**

Fuzz planting in the glasshouse in August, 1954, gave a field planting of 6,384 seedlings, the progeny of 32 bi-parental crosses. These seedlings, which were transplanted to the field at the end of October and early November, 1954, yielded 159 varieties for further planting when selected in June, 1955.

### Progressive Seedling Trials

The 40-sett plots planted in 1954 contained 80 Burdekin "53" series seedlings, seven "I" series, five "J" series, two "K" series seedlings and Vidar, all of which were brought from the Northern Sugar Experiment Station through the Clare isolation plot. In addition, four varieties, Q.56, Q.58, E.129 and Luna, which were received from Brisbane quarantine house, were included. From this total of 99 varieties, 20 were selected for inclusion in the 1955 yield observation trial, while 18 others will be again included in 40-sett plots.

No selections were made from the yield observation trial planted in 1954, which contains 25 "N" series seedlings, M.336, I.244, I.275, I.302, J.211, Ragnar and Mowbray Seedling, for the selection method was modified last year to make selections in the first ratoon crop. Under this new method the yield from the plant crop, progressive maturity testing, ratooning ability and general agricultural features can be taken into consideration.

This information, available from the 1953 plant yield observation trial in which were "M" series (Burdekin) and "I" series (Meringa) seedlings, provided data for the selection from the first ratoons of the trial. Four "M" series seedlings were selected for planting the advanced randomised block trial. One of these, M.421, a heavy yielding cane which gave better results in both cane per acre and sugar content than the standard, shows satisfactory vigour in ratoons, and although it may be somewhat thinner in the stalk than many Burdekin varieties, its return of sugar per acre may give it a place in the district varieties in the future. M.415 in this trial gave a very heavy crop of lower sugar content than the standards, though the return of sugar per acre was so much better than standard varieties that it must be given a further trial. In the plant yield observation trial, the remaining two selected canes, M.441 and M.456, gave returns quite comparable with the two standard varieties in the trial.

The randomised block trial planted in 1954, using two Burdekin seedlings, L.469 and L.423, two P.O.J. varieties, 2961 and 3016, with suitable standards, shows that the "L" series seedlings are well worth further trial on farm plantings, and although the P.O.J. varieties produce heavy yields their tendency to lodge makes them unsuitable for conditions on the average Burdekin farm.

### Effects of Benzene Hexachloride on Cane Growth

First ratoons of a BHC toxicity trial, where the effects of different amounts of both the crude and the refined product on crop growth are being investigated, yielded an average of about 35 tons of cane per acre. Conditions for the trial were quite satisfactory and as in the plant crop, no significant differences in yields between treatments could be detected. The field was ploughed out after harvest and will be replanted to carry on the trial; after a number of years any cumulative toxic effect of BHC should be detected.

**Fig. 25—This field had been planted just before the heavy May rains. Considerable replanting was rendered necessary.**

### Long Range Ratooning Trial

Cane in the trial to investigate the value of ratooning received some severe checks during its plant crop, when a shortage of Station labour resulted in poorer cultivation and irrigation than would normally have been given to the crop. This has tended to produce some growth irregularities in the field, which naturally must affect the accuracy of the trial.

**Fig. 26—Annual Field Day at Ayr Experiment Station. Visitors inspect a line up of old and new varieties.**

### New Varieties for the Burdekin

In September, 1954, the following varieties were introduced from the Brisbane quarantine house, and since growth conditions were not favourable, only a small quantity of plants will be available. Varieties are B.45-151, B.47-419, B.47-44, B.O.10, B.O.11, B.O.28, B.O.29, C.P.38-34, C.P.50-11, C1.38-32, I.70, Sirius, and 40S.N.746. After a further propagation these varieties will be included in the Station 40-sett plots.

The Clare isolation plot was used again to introduce "K" series seedlings 622, 641, 646, 648, 649, 657, 672, 675, 690, 696, 703, 728, and Q.59

from the Northern Sugar Experiment Station, while small amounts of B.4362, H.39-3633, H.39-7028, H.44-2818, H.44-3098, H.45-369, H.45-2120, H.45-2780 were also planted at Clare for propagation.

**Ratoon Stunting Disease Control**

A trial which aimed at determining the time/temperature combination required to cure cane affected by ratoon stunting disease was undertaken, and the effects on germination in four varieties (Badila, S.J.16, Trojan and Pindar) provided some useful information. Disease symptoms in the Burdekin area are often difficult to detect, and an examination of the trial suggests that the plant crop may not give the information sought.

**Annual Field Day on 9th June, 1955**

Showery weather conditions and the Burdekin River flooding interrupting road transport from Home Hill area caused fewer visitors to attend than had been expected. Approximately 200 growers were interested in the Bureau's activities in the production and testing of new varieties and in other Station trials.

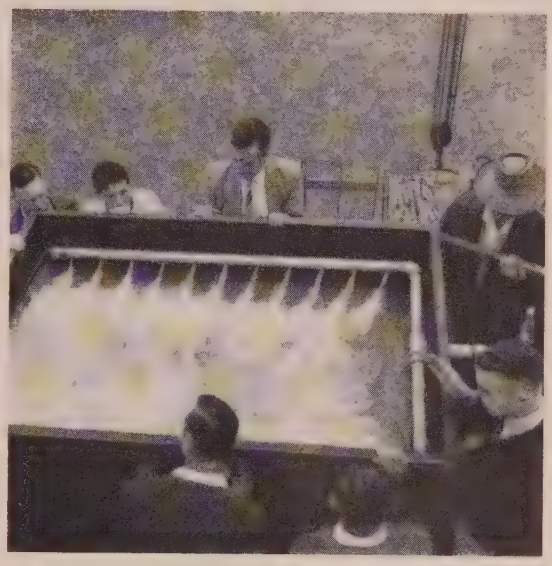


**Fig. 27—The hot water treatment tank on the Ayr Station.**

## LABORATORY WORK

Analyses of cane samples at this Station during the year may be summarised as follows:—

| | |
|---|---|
| Station | 449 |
| Farm trials | 96 |
| Farmers' samples | 16 |
| Total | 561 |

**Summary of Crops Grown on the Station**

Varieties harvested during 1954 season for milling:

| | |
|---|---|
| Trojan | 221.41 tons |
| Pindar | 123.24 ,, |
| S.J.16 | 71.59 ,, |
| Badila | 83.23 ,, |
| Comus | 29.51 ,, |
| Experimental Vars. | 780.05 ,, |
| Total | 1309.03 ,, |

| | |
|---|---|
| Plant cane harvested | 796.43 tons |
| First ratoon cane harvested | 512.60 ,, |
| | 1309.03 ,, |
| Total cane harvested for milling | 1309.03 tons |
| Used for sample plants, etc. | 55.60 ,, |
| Total crops | 1364.63 ,, |
| Total acreage harvested | 28.19 acres |
| Average tonnage per acre | 48.41 tons |

# Central Sugar Experiment Station

(C. G. Story, Officer in Charge)

## Notes on Weather and Crops in the District

Unusual weather conditions occurred for the period under review. The Mackay district enjoyed an open winter, and good soil moisture conditions obtained until the three weeks drought in January, 1955. Scattered light rain was received in July and Mackay fortunately missed the cyclonic weather early in that month. Crushing was disrupted at most of the district mills due to rain which fell in mid-August.

Cane germinated well and ratooned favourably in August and crops made rapid progress in September. The late rains, combined with mild conditions which promoted growth in the cane, contributed to the comparatively low c.c.s. figures early in September. This position had improved considerably by the end of the month.

Less area was planted in 1954 since the district was stabilising on acreages in expectation of the imposition of restrictions to peaks.

The district had the wettest October in 50 years following rainfall extending over a period of 72 hours, which delayed crushing for a week. Crop growth was prolific—the best for many years in October, which is normally a dry period. The excellent crop progress continued throughout November when good rainfall and growing conditions were experienced, and some July planted blocks of cane were out of hand by mid-November. The position was in direct contrast to November, 1953.

Septimus recorded the heaviest hail for 40 years on the 10th November, while on the 21st and 23rd severe storms flattened hundreds of acres of cane in the Mia Mia, Owens Creek and Mirani areas. The annual rainfall for 1954 at the Experiment Station was 115.39 inches, recorded on 144 days; from the 1st July to 31st December, 22.21 inches fell on 53 days. January rainfall was below average, and that which fell at the end of January was required to ensure crop development. Ideal conditions for growth occurred in February, but heavy rainfall caused local flooding during the first fortnight and the last week of the month. In March the rainfall was the highest recorded for that month in 50 years. Cyclonic conditions were experienced on the 7th and 8th, but damage was not so great as in 1950. Torrential rainfall led to general flooding and an aftermath of the cyclone will be harvesting difficulties associated with bent cane.

The district had experienced practically continuous rainfall from 22nd January to 24th March and crops made very good progress during the first and last weeks of March. Showery weather and very good growing conditions prevailed during April, but weather conditions practically prevented early planting. May rainfall was phenomenal and the heaviest on record since 1901; most of it was recorded from the 24th to the 26th, and this resulted in a postponement of planting until July-August. Some cold, bleak days were experienced in May and June, but the sunshine following the deluge in May was beneficial in drying out of water soaked fields.

**Annual Rainfall since 1935 at the Experiment Station, Mackay**

| Year | Rainfall in Inches | Year | Rainfall in Inches |
|---|---|---|---|
| 1935–36 .. | 99.57 | 1945–46 .. | 68.52 |
| 1936–37 .. | 64.21 | 1946–47 .. | 48.09 |
| 1937–38 .. | 47.21 | 1947–48 .. | 38.40 |
| 1938–39 .. | 61.29 | 1948–49 .. | 46.95 |
| 1939–40 .. | 82.86 | 1949–50 .. | 85.48 |
| 1940–41 .. | 73.71 | 1950–51 .. | 107.63 |
| 1941–42 .. | 57.75 | 1951–52 .. | 41.68 |
| 1942–43 .. | 76.13 | 1952–53 .. | 56.58 |
| 1943–44 .. | 58.67 | 1953–54 .. | 102.57 |
| 1944–45 .. | 33.53 | 1954–55 .. | 129.44 |

Average for 20 years: 69.01 inches.

## Legume Crops

Canegrowers exhibited a keen interest in legumes and large areas were planted early with velvet beans and Reeves' cowpea. Reduced seed prices and the use of planting machines for velvet beans will be an added incentive to plant large areas in

**Abstract of Meteorological Observations made at the Central Sugar Experiment Station during period 1st July, 1954, to 30th June, 1955**

| Month | Rainfall (inches) | No. of wet days | Shade Temperature | | | | | | Mean Diurnal Range | Mean Temperature 9 a.m. | Mean per cent. Relative Humidity 9 a.m. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Maximum | | | Minimum | | | | | |
| | | | High | Low | Mean | High | Low | Mean | | | |
| 1954 | | | | | | | | | | | |
| July .. | 1·48 | 7 | 77·5 | 67·5 | 74·3 | 64 | 38·5 | 53·2 | 21·1 | 64·96 | 80·44 |
| August .. | 1·49 | 7 | 78 | 66 | 74·4 | 66 | 44 | 56·2 | 18·2 | 68·36 | 79·00 |
| September | ·66 | 6 | 85·5 | 73·5 | 77·9 | 68 | 45 | 55·9 | 22 | 72·21 | 65·25 |
| October .. | 10·36 | 11 | 87 | 72 | 80·2 | 71 | 57·5 | 65·4 | 14·8 | 76·37 | 69·90 |
| November | 6·35 | 9 | 90 | 80·5 | 84·8 | 72 | 60 | 65·9 | 18·9 | 80·98 | 65·42 |
| December.. | 1·87 | 13 | 87 | 80·5 | 84·1 | 73·5 | 62 | 67·8 | 16·3 | 79·93 | 68·34 |
| 1955 | | | | | | | | | | | |
| January .. | 7·88 | 16 | 91 | 82 | 86·5 | 76 | 60·5 | 67·6 | 18·9 | 81·06 | 70·69 |
| February .. | 28·12 | 24 | 91 | 79 | 84·2 | 75 | 68 | 72·2 | 12 | 80·15 | 84·66 |
| March .. | 40·73 | 23 | 93 | 72·5 | 83·9 | 75 | 61 | 70·1 | 13·8 | 78·90 | 79·23 |
| April .. | 6·76 | 19 | 87·5 | 70·5 | 81·2 | 72 | 60·5 | 66·0 | 15·2 | 76·15 | 82·23 |
| May .. | 22·65 | 11 | 85 | 63·5 | 77·1 | 71 | 47 | 61·4 | 15·7 | 70·81 | 78·26 |
| June .. | 1·09 | 12 | 79·8 | 66 | 72·9 | 65 | 44 | 54·8 | 18·1 | 65·18 | 81·93 |

**Figs. 28 and 29—Two views of the Mackay Sugar Experiment Station eight hours after rain had ceased in May, 1955. Twenty-one inches had fallen in the preceding three days.**

the future. This will assist the farm rotation under peak restrictions.

### Soil Conservation

Canegrowers in the Plane Creek area have become conscious of the value of soil conservation, and requests for this service have increased considerably. The results achieved on one 17 acre field have repaid the effort and finance expended on this particular project.

### Tractor School

The Mackay District Canegrowers' Executive held a successful tractor school at Pleystowe in

**Fig. 29**

early March, although the cyclone reduced the schedule of the school to three and a half days.

### Clean Cane Propagation

The Mackay, Plane Creek and Proserpine Cane Pest and Disease Control Boards carried out a large disease-free cane plant propagation programme during the spring of 1954, and it was estimated that approximately 80,000 tons of clean plants would be available for 1955 planting; unfortunately, chlorotic streak disease was an unexpected complication which upset the distribution programme in the Mackay district. In addition, the hot-water treatment tanks were also in operation during spring 1954.

One outstanding feature noted in all areas was the rapid and even germination of progeny of hot-water treated compared with non-treated cane. The general appearance and growth of the former was excellent and generally compared more than favourably with neighbouring untreated crops.

### Chlorotic Streak Disease

This disease has been spread, unwittingly, throughout a large portion of the district by the use of plants from hot-water treated blocks of cane which developed secondary infection, and by water flowing from diseased blocks to clean fields. Most of the areas affected are on low lying country with interconnected farm drainage schemes, an ideal condition for spreading the disease during periods of prolonged and heavy rains; in consequence chlorotic streak is now well established in Mackay. New centres of the disease were found at Proserpine.

### Diseases Generally

Red rot disease was present in canefields in the Mackay-Proserpine area in July, 1954, and the amount had increased by September; it affected the germination of some of the later planted blocks of cane.

Pineapple disease was reported on four occasions, two in July and two in September. There was a further gain in the popularity of organic mercurial compounds, especially when a spray outfit was attached to a cutter-planter; the general purpose of this treatment, at present, is for stimulation of germination.

Sclerospora disease was discovered at Eton and Plane Creek, and the fire blight stage of eye spot in Trojan occurred at Mia Mia.

### Grub and Rat Damage Below Normal

Following the late greyback beetle emergence, damage to untreated fields was negligible for the 1954 crop and was the lowest recorded for 14 years. The BHC programme was reduced, and 2,410 acres were treated with BHC in 1954 to protect the 1955 crop, damage to which is almost absent in the area. Light beetle flights occurred from mid-November. Very little damage was caused to the 1954 crop by frenchi grubs.

Rats were prevalent in Plane Creek and Owens Creek areas and scattered rat damage of little consequence occurred in many parts of the district.

## EXPERIMENT STATION OPERATIONS

### Annual Seedling Selection

Selection of two batches of seedlings planted in the field in July and November, 1954, resulted in 142 seedlings, representing 23 families, being carried forward for vegetative reproduction and comparison with standards. The July planting yielded 93 seedlings, and the November planting 49. Late planted seedlings made poor growth, and July planting appeared preferable for the best results. At the same time, 22 canes of the 1951 New Guinea collection, and three other varieties, were included in the planting; the latter were Luna, Q.51 and Q.55.

### Progressive Seedling Trials

Twenty-one of the "M" series seedlings were selected from first ratoon 40-sett plots. These, plus eight "L" series seedlings, repeated from another yield observation trial, were planted in a yield observation trial against Q.50.

Four "M" seedlings, plus three "K.P." series seedlings, were selected from first ratoon 40-sett plots for alluvial and better class land in the Mackay district. All except one have Badila as one parent; these seven seedlings were planted in a yield observation trial against P.O.J.2878.

The general standard of the 20 "K" series seedlings in the first ratoon yield observation trial was below that of Q.50, and this series was discarded. The five introductions, Co.331, P.O.J.2961, P.O.J.2967, 41S.N.3339, 41S.N.3621 and Q.57, in

this trial were inferior to Q.50, but P.O.J.2961 and Q.57 have been transferred to trials on better class soil types.

The yield observation trial of the 24 "L" series seedlings planted in 1953 was harvested in September, 1954. It included introductions F.108, P.O.J.3016 and 38S.N.473. At harvest only one seedling was superior to Q.50; some yielded good sugar early but selections for replicated trials will be made on the first ratoon crop.

**Fig. 30—Spray irrigation of newly planted seedlings on Mackay Station.**

The first ratoon crop of the randomised trial with "J" series seedlings, Q.50 and Q.58 was harvested at the end of November, 1954. Q.58 gave the best results both in crop and sugar per acre. The sugar per acre figures of J.125 for both plant and first ratoon crops were ahead of Q.50 and it has been allotted a "Q" number, namely, Q.63. One main feature of this variety, throughout all trials, has been its good sugar figures, both early and late. The summary of sugar per acre yields for the plant and first ratoon crops of the three leading varieties was Q.58 (10.53 tons), J.125 (10.00 tons) and Q.50 (8.91 tons).

### Variety Introductions

Thirteen cane varieties released from the quarantine house during 1954 were planted on the Experiment Station. These included B.45/151, B.47/44, B.47/419 from Barbados; B.O.10, B.O.11, B.O.28, B.O.29 from India; C.P.38/34 and C.P. 50/11 from Canal Point; Cl.38/32 from Florida; and I.70, 45M.Q.2569 and 40S.N.746.

### Rotary Filter Mud as a Fertilizer

Trials have been in operation since 1946 on the Experiment Station to obtain information on the value of rotary filter mud as a fertilizer, the treatments comprising 20 and 40 tons per acre and a control. There is also incorporated a fertilizer trial in which the value of 0, 1½ and 3 cwt. per acre of Sugar Bureau No. 2 Mixture is being investigated in conjunction with the varying amounts of mud.

The first ratoon crop of the second rotation was harvested in August, 1954. There were significant differences in cane and sugar yields, the main items of interest being—

(1) where 1½ or 3 cwt. of fertilizer had been applied, the addition of mud gave no further increase.

(2) where no fertilizer was applied, 20 tons of mud did not give a significant response, and 40 tons were necessary for an increase.

(3) with 0 or 20 tons of mud, fertilizer was still necessary, and 1½ cwt. was as good as 3 cwt.

(4) with 40 tons of mud no fertilizer was necessary.

**Fig. 31—The new Mackay release—Q.58. This picture illustrates the excellent stooling of the variety.**

Briefly, the trial showed that, as far as fertilizer was concerned, 1½ cwt. only was required and this produced as good a crop as 40 tons of mud. Growers have also found that irrigation is necessary for best results with filter mud.

### Rock Phosphate *versus* Superphosphate

The second ratoon crop of this long term trial was harvested in October, 1954, but no significant differences were measurable. In this experiment, the value of superphosphate was compared with finely ground rock phosphate. This trial is to be continued over several cycles to determine (*a*) the rate at which this soil becomes depleted in phosphate; (*b*) whether the amounts used will result in a build-up of soil phosphate; and (*c*) to what extent rock phosphate can be used to replace superphosphate on this acid soil, which is inundated for varying periods every wet season.

### Sweet Sorghum—Doubtful Soil Improver

The first ratoon crop of the soil improvement trial containing the treatments velvet bean, sorghum, and a velvet bean/sorghum mixture did not correlate with the results obtained in the laboratory using sweet sorghum as a soil improver. The field results with sweet sorghum did not indicate any improvement in crop, either in cane or sugar per acre.

### Observations on the Value of Long Fallowing

Following the observations made on the plant crop in 1953 of the beneficial effect of introducing a long fallow into the normal cane cropping cycle, it is noteworthy that these results persisted and were quite noticeable in the first ratoon crop harvested this year. The four treatments in this non-replicated observational block are (*a*) normal cane cycle (one plant and two ratoon crops with a six month legume fallow); (*b*) four year grass fallow before planting with cane; (*c*) two years grass fallow plus six months legume fallow; (*d*) two and a half years perennial legume fallow.

The total yields harvested from the two crops of these treatments were 56, 75, 64 and 65 tons per acre respectively. The treatments are not replicated but the soil is reasonably uniform and it would appear that the increased crop in (*b*) is due mainly to the beneficial effect of the long fallow under grass.

### Bagasse plus Deep Ripping as a Soil Ameliorant

The plant crop of this trial set out at the end of September, 1953, was harvested in 1954, at the age of 12 months. Even though the crop was poor, due to late planting, the results from ripping, and from bagasse plus ripping, were superior to normal cane-growing procedure. The operation of deep ripping is relatively costly and would be justified only if results were apparent for a number of years. Whereas a wet season may cause the clay in the ripped areas to run together again, it is expected the bagasse may prevent this in the bagasse plots. The result would be better water penetration, deeper rooting, and quicker drainage, with consequent earlier cultivation.

### Time of Application of Nitrogen

This trial on a second ratoon crop of Q.50 produced somewhat unexpected results. In a comparison of late applications of sulphate of ammonia —(*a*) end of February, (*b*) mid-March, and (*c*) end of March—there were no significant differences at any time between the treatments, and it seemed as though a late application of sulphate of ammonia did not bring about a depression of c.c.s., nor did it, apparently, delay maturity. Monthly analyses were conducted from May to November and yields were obtained at harvest. The results of this trial justify repetition on a crop cycle for three years since the very wet year experienced at Mackay may have contributed to the above results.

### Time/Temperature Treatment Trial

A trial based on eight varieties and eight time/temperature treatments was planted in September, 1954. The results of inspections for ratoon stunting disease suggest that 50° C. for three hours is a better treatment for thicker varieties of cane for the control of ratoon stunting disease, but the overall germination showed a reduction of 27 per cent. in comparison with the two hour treatment.

### Trials with New Legumes

Thirteen legume varieties including cowpeas and Mung bean were planted in a comparative trial with Reeves' cowpea and Poona pea. The planting site was flooded on a number of occasions and seed was collected from plants which survived. These will be planted in a further trial in 1955. Mung bean showed promise under the wet conditions of the trial.

### Weedicide Investigations

Sodium trichloracetate applied at the end of November to a dense stand of young Barnyard grass (*Echinochloa crus-galli*), three inches high, gave excellent results within a month. At the rate of 10 lb. per acre practically all the young grass was killed; while, at 20 lb. per acre, a complete kill and clean area resulted. This has possibilities under similar moist conditions where Barnyard grass thrives following rainfall, and where rapid growth conditions allow for the quick uptake of the chemical from the soil. Treatments were repeated on further areas of this grass to a height of six inches with similar results.

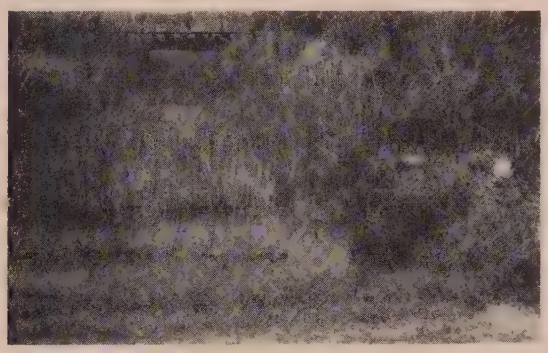


**Fig. 32—Result of applying 100 lb. TCA per acre to a para grass infested drain on Mackay Station. Only a few dead stalks are left in the drain while the unsprayed banks are carrying a heavy body of grass.**

A repetition of previous work with Para grass (*Brachiaria mutica*) and sodium trichloracetate at the rate of 100 lb. per acre gave excellent results. The surface of the trial area was inundated for six months from the end of January, 1955, and, on a number of occasions, the trial area was completely submerged. Respraying was necessary on some sections on the 10th May. General conclusions from the trial were that the chemical method of control was far cheaper than manual control of Para grass in drains.

There are indications that the boron derivative, Borascu, may have possibilities as a soil sterilant on fence lines, providing it is mixed with surface soil to stabilise its position.

The weedicide combination MCPA/TCA did not give any better results on nut grass (*Cyperus rotundus*) than the sodium salt of 2,4-D. The speed of action of 2,4-D on nut grass is accelerated by using higher rates of application, but care is necessary amongst young cane, as very heavy applications may cause malformation.

Spraying the seed of Seaforth Burr with 2,4-D delayed the germination one month, but did not affect the ultimate germination.

### Annual Field Day

On June 7th, 1954, some 650 canegrowers, mill executives and others interested in the sugar industry visited the Station and were conducted on tours of inspection of the blocks. Among the many features displayed on the Station, symptours of chlorotic streak disease and the time/temperatme treatment trial for ratoon stunting disease caused considerable interest amongst those present. The tractor and implement display was a record for a Field Day.

### Laboratory Work

The following is a summary of the c.c.s. analyses carried out during the year:—

| | |
|---|---|
| Experiment Station .. | 900 |
| Farm trials .. .. | 748 |
| Growers' samples .. | 177 |
| Show canes .. .. | 29 |
| | 1854 |

### Summary of Crops Grown on Station

| | | |
|---|---|---|
| Varieties harvested during 1954 Season:— | | |
| Q.50 .. .. .. .. | 437.09 | tons |
| Q.58 .. .. .. .. | 36.69 | ,, |
| Seedlings .. .. .. .. | 290.62 | ,, |
| Total .. .. .. | 754.4 | ,, |
| Plant cane harvested .. .. | 217.09 | tons |
| First ratoon cane harvested .. | 434.49 | ,, |
| Second ratoon cane harvested .. | 102.82 | ,, |
| Total .. .. .. | 754.4 | ,, |
| Total cane harvested for mill .. | 754.4 | tons |
| Used for samples, plants, farm propagation and trials .. .. | 32.55 | ,, |
| Total crops .. .. | 786.95 | ,, |
| Total acreage harvested .. | 36.48 | acres |
| Average tonnage per acre .. | 21.6 | tons |

# Southern Sugar Experiment Station

(H. G. KNUST, Officer in Charge)

## Weather and Crops

Weather conditions during the winter months of 1954 were unusually mild, and as a consequence no frosts were recorded. Such absence of frosts has not been experienced since 1948. Undoubtedly the flood rains accompanied by strong wind early in July and good follow-up rain in August contributed largely to the lack of frosts by reducing the rate of radiation from the soil during the night hours. Excellent conditions prevailed until early summer, by which time it was evident that crop deterioration could occur if the normal December-January rains failed to materialise. Unfortunately the crop received a set-back from continued dry summer conditions and did not make a rapid recovery after good rain fell in February; as a consequence yields per acre will be below those of 1954. Rainfall since January has been well above normal, the average *annual* registration having been exceeded during the first five months of 1955. Planting during the autumn months of 1955 has taken longer than usual because of the extended wet season, and stands of cane are not as well advanced as in former years. Winter conditions to date in 1955 have been mild, and no frosts have been recorded.

## The 1954 Harvesting Season

Crushing began at the first of the southern mills on 23rd June and although it was intended that the balance—with the exception of Rocky Point—should begin crushing operations by the 14th July a cyclonic disturbance and floods delayed the commencement at some mills and caused a temporary cessation at others. At one mill some of the pumping plant was damaged by flood debris and crushing was held up until repairs were effected. All mills in the Bundaberg-Isis district were crushing normally by the 26th July and thereafter experienced no excessive lost time because of weather conditions. Unfortunately, the time lost through wet weather at the commencement of the season caused a late finish. Five mills were crushing in January and the last to finish was Isis on the 13th January when the Bundaberg-Isis district aggregated 1,502,380 tons of cane with an outturn of 189,907 tons of sugar. Both figures constitute records and the average yield of cane, 26.87 tons per acre, from 55,915 acres is highly satisfactory.

## The 1955 Growing Season

The autumn planted cane of 1954 did not receive

**Abstract of Meteorological Observations made at the Southern Sugar Experiment Station, Bundaberg, from 1st July, 1954, to 30th June, 1955**

| Month | Rainfall (inches) | No. of wet days | Shade Temperatures | | | | | | Mean Dirunal Range | Mean Temperature 9 a.m. | Mean per cent. Relative Humidity 9 a.m. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Maximum | | | Minimum | | | | | |
| | | | High | Low | Mean | High | Low | Mean | | | |
| 1954 | | | | | | | | | | | |
| July .. | 16·80 | 9 | 76 | 63 | 71·06 | 62 | 41 | 51·03 | 20·03 | 59·19 | 81·45 |
| August .. | 2·01 | 8 | 77 | 56 | 71·35 | 60 | 44 | 51·90 | 19·45 | 59·61 | 77·45 |
| September | 2·74 | 8 | 79 | 71 | 73·93 | 60 | 47 | 53·60 | 20·33 | 62·30 | 72·33 |
| October .. | 3·81 | 11 | 82 | 72 | 76·90 | 70 | 54 | 61·13 | 15·77 | 69·46 | 70·06 |
| November | 2·29 | 9 | 89 | 80 | 82·92 | 73 | 56 | 65·57 | 17·35 | 74·92 | 71·60 |
| December.. | 1·74 | 6 | 87 | 82 | 84·26 | 71 | 60 | 66·37 | 17·89 | 76·29 | 72·29 |
| 1955 | | | | | | | | | | | |
| January .. | 3·41 | 10 | 88 | 81 | 85·56 | 73 | 61 | 68·79 | 16·77 | 78·79 | 72·91 |
| February .. | 15·00 | 15 | 88 | 74 | 83·35 | 77 | 65 | 70·42 | 12·93 | 77·37 | 83·40 |
| March .. | 11·99 | 22 | 87 | 77 | 82·83 | 77 | 63 | 70·16 | 12·67 | 76·58 | 81·55 |
| April .. | 5·90 | 12 | 86 | 70 | 80·19 | 70 | 58 | 64·73 | 15·46 | 71·42 | 80·34 |
| May .. | 7·71 | 10 | 82 | 65 | 74·72 | 66 | 42 | 58·10 | 16·62 | 64·68 | 76·03 |
| June .. | ·55 | 9 | 77 | 64 | 71·00 | 62 | 42 | 52·50 | 18·50 | 59·50 | 81·28 |

any growth check during the late autumn and winter months, and responded rapidly to the good spring conditions. Spring planted cane germinated well, and ratooning was rapid and vigorous. As mentioned above, the crops were so well grown by early summer that good, regular rainfall was essential for crop development during the high temperature period. Unfortunately near-drought conditions prevailed from mid-November until late January, and the crops did not recover rapidly from the set-back received. Gale force winds experienced in February and March did not damage the crop, but the slight bend in the cane from this cause will be responsible for reduced loading to the mills.

Weather conditions have undoubtedly favoured arrowing. Arrows began to emerge along the coastal fringe of the district towards the end of April and, by the end of May, flowering was heavy in C.P.29/116 and N.Co.310 throughout the area.

**Rainfall Records at Southern Sugar Experiment Station for the past 31 years**

| Year July-June | Rainfall in Inches | Year July-June | Rainfall in Inches |
|---|---|---|---|
| 1914–15 | 31.99 | 1935–36 | 44.24 |
| 1915–16 | 28.54 | 1936–37 | 31.65 |
| 1916–17 | 58.08 | 1937–38 | 44.40 |
| 1917–18 | 49.85 | 1938–39 | 41.01 |
| 1918–19 | 24.24 | 1939–40 | 41.69 |
| 1919–20 | 28.20 | 1940–41 | 43.26 |
| 1920–21 | 45.16 | 1941–42 | 33.52 |
| 1921–22 | 44.97 | 1942–43 | 40.75 |
| 1922–23 | 37.14 | 1943–44 | 45.22 |
| 1923–24 | 34.16 | 1944–45 | 28.14 |
| 1924–25 | 50.96 | 1945–46 | 26.10 |
| 1925–26 | 37.62 | 1946–47 | 44.52 |
| 1926–27 | 68.18 | 1947–48 | 57.76 |
| 1927–28 | 74.69 | 1948–49 | 40.18 |
| 1928–29 | 31.16 | 1949–50 | 59.31 |
| 1929–30 | 43.16 | 1950–51 | 50.74 |
| 1930–31 | 47.19 | 1951–52 | 40.42 |
| 1931–32 | 22.88 | 1952–53 | 48.99 |
| 1932–33 | 36.81 | 1953–54 | 45.81 |
| 1933–34 | 71.45 | 1954–55 | 73.95 |
| 1934–35 | 40.01 | | |

Average for 41 years: 43.61.

### Hot Water Treatment of Cane Plants

Cane Pest and Disease Control Boards in the southern districts actively pursued the hot-water treatment campaign inaugurated in 1953 for the control of ratoon stunting disease. Jute sacks, formerly used as containers for the cane plants, were replaced by steel framed, wire-netting baskets, and water circulation systems were installed in tanks. It is anticipated that large supplies of clean planting material will be available in 1956 and, by 1957, clean planting material should be available for all plantings.

### Ratoon Failure

Ratoon failures which appear to be caused by a species of *Verticillium* seemed to be as widespread as in 1953 and no definite conclusions can be drawn from experiments established to date. Although a verticillium fungus is found associated with the cane stubble, it is by no means certain that this is the primary cause of the ratoon failure. It is likely that there is some predisposing factor. Investigations are proceeding.

### Damage by Cane Grubs

Small emergences of the cane beetles *L. trichosterna* Lea and *P. furfuracea* Burm. occurred during October, 1954, and damage by grubs from the 1952 generation caused little concern. Fumigation with carbon bisulphide was practised on only five acres, and no reports of any other damage were received. Effective control of these pests has not yet been achieved with BHC, and it is doubtful if it would be economical to use this insecticide while the location of infested parts of fields is highly problematical, and cannot be determined until damage is occurring. Fortunately crop response is rapid if fumigation is practised before distress has developed to a high degree, and yields are satisfactory.

An outbreak of *R. dimidiata* occurred on a few farms in the Millaquin area and because of the patchy, erratic occurrence of this pest it was not possible to carry out satisfactory experiments in the control of that generation. Exploratory trials with BHC dust have been laid down in the affected area and should provide some information if the trouble occurs next year.

### Distribution of New Varieties

A distribution of disease-free stocks of N.Co.310 and Vesta was made to growers during the spring months of 1954. It was evident from the number of applications received—338 for 766 tons of N.Co.310, and 147 for 300 tons of Vesta—that

growers' interest in new varieties has not lessened, despite the high yielding capacity of the present commercial canes. These two varieties—one early maturing and the other suitable for standing over—are valuable additions to the approved lists in Bundaberg.

### Elliott Variety Garden

Our varietal collection, consisting of more than 300 varieties, was planted during the spring on our lease at the Elliott River. This collection contains a good proportion of the canes grown to date in Australia for commercial purposes, breeding canes raised on our breeding Station, the Bureau 1951 New Guinea collection and some varieties recently imported from other countries. All canes received a curative treatment against ratoon stunting disease before being planted.

## EXPERIMENT STATION OPERATIONS

### Plant Introduction

Varieties introduced from the Bureau's Brisbane quarantine consisted of B.47-44, B.47-419, B.O.11, B.O.28, B.O.29 and C.P.38-34, which were imported from overseas in 1953, and 40S.N.746 from the Sydney nursery of the Colonial Sugar Refining Company in the same year. These are being propagated, and will be planted in their first selection trials in the spring of 1955. In addition C.P.48/103, Cl.41/142, F.31-436, F.31-962, F.36-819, Luna, E.129, Q.56 and Q.58 which were received from quarantine in 1953, had multiplied sufficiently for planting in a trial in comparison with a standard cane.

### First Year Seedlings

Fifty-eight Q.53 series seedlings were selected during annual seedling selection and subsequently planted in the first selection trial with a standard variety for comparison.

### Progressive Trials

Thirty-six of the 78 "N" series seedlings planted in the first year selection trial in 1953 were selected and planted in a yield observation trial which also included B.41-227, C.P.43-47, C.P.44-155, H.39-5803 and H.47-2910 imported from other countries. In addition, 50 selected "N" series seedlings were forwarded to Beerwah isolation nursery for subsequent trial in the Moreton district.

The "M" series seedlings, B.37-161, C.P.36/111, C.P.36/183, C.P.43/64, C.P.44/101, C.P.49/50, H.37-1933, F.134 and two seedlings of the "L" series which were planted in a yield observation trial in the spring of 1953 indicated, when harvested, that many of the "M" series, B.37-161, C.P.44/101, F.134 and H.37-1933 had outyielded the standard Q.47. However, final selections for use in replicated trials will be made before the first ratoon crop is harvested. During the cyclonic conditions in March, 1955, extensive stalk damage occurred in C.P.44/101.

**Fig. 33—The new seedling variety H.6 at Gin Gin. This is eight months old first ratoons.**

The yield observation trial of the "L" series seedlings progressed a stage further when the first ratoon crop was harvested in the spring of 1954. Co.475, F.108, P.O.J.2967, P.O.J.3016 and K.128 were also included in this trial with Q.47 as the standard. Selections were made just before the crop was harvested and 17 of the "L" series seedlings were transferred to a district farm for propagation for subsequent use in replicated trials. Yields from Co.475 were also better than Q.47, but this variety is not being persevered with because of its high susceptibility to red rot in southern Queensland.

### The Effect of Repeated BHC Applications

In the autumn of 1952 a trial which included both refined (88 per cent. gamma isomer) and crude (13 per cent. gamma isomer) BHC was established to determine whether continued heavy applications of this insecticide would retard crop growth. Certain plots were retreated in the ratoon crop and, as no grub infestation occurs on the Station, this trial provides essential information for forecasting whether or not repeated applications of abnormally high quantities of BHC are likely to have harmful effects on the crop growth. In one treatment the cane was subjected to an application of BHC three times higher than the normal quantity required for greyback grub control. Differences in the resulting yields, which average 38.67 tons per acre in the plant crop and 34.6 tons in the first ratoon, were not significant, and it is evident that the insecticide has not affected yields to date.

**Fig. 34—Contour cane planting in the Childers district. Soil conservation practices are becoming popular on these red-soil hillsides.**

Another trial involving the use of concentrated (60 per cent. gamma isomer) and crude (13 per cent. gamma isomer) BHC mixed with a complete commercial fertilizer, was planted in the autumn of 1953 in an attempt to determine whether the more refined product inhibits the uptake of fertilizer less than the equivalent quantity of crude BHC, when the mixtures are applied in the drill at planting time. Following an indifferent germination even in the untreated check plots, the trial had to be extensively supplied. This resulted in considerable displacement of BHC—fertilizer mixtures and the final yields did not disclose any clean-cut tendencies.

### Permanent Trash Trial

This harvest completed the sixth rotation of a trash trial inaugurated in 1933, at a time when pre-harvest burning of cane was coming into vogue. The procedure adopted is to conserve trash in alternate interspaces for comparison with the complete destruction of all crop residue. The tabulated results indicate that there has not been any gain from the costly method of conserving trash on a red volcanic loam, under non-irrigated conditions, in Southern Queensland.

Investigations in some overseas sugar growing countries have led to the belief that trash conservation benefits may be related to the potash content of the trash, particularly on potash deficient soils. To investigate this phase of the work the entire trial area—trash and no-trash—was divided into 32 plots, half of which received NP dressings and the other half the normal NPK. It is hoped in future rotations of the trial to assess whether potash in the trash is contributing appreciably to plant nutrition in the trash-conserved sections.

| Year of Harvest | Variety and Class | Trash Plots | | No Trash Plots | |
|---|---|---|---|---|---|
| | | Cane per acre tons | Sugar per acre tons | Cane per acre tons | Sugar per acre tons |
| 1934 | Q.813 Pl. | 36·2 | 5·83 | 36·2 | 5·68 |
| 1935 | Q.813 1st R. | 9·4 | 1·24 | 13·1 | 1·69 |
| 1937 | P.O.J.2725 Pl. | 19·1 | 3·11 | 18·6 | 3·11 |
| 1938 | P.O.J.2725 1st R. | 39·5 | 5·53 | 34·7 | 5·03 |
| 1939 | P.O.J.2725 2nd R. | 30·9 | 4·85 | 29·0 | 4·41 |
| 1941 | P.O.J.2878 Pl. | 44·0 | 6·42 | 43·9 | 6·25 |
| 1943 | P.O.J.2878 S/O 1st R. | 42·9 | 6·48 | 43·6 | 6·67 |
| 1946 | P.O.J.2878 S/O A.P. | 15·7 | 1·95 | 17·1 | 2·09 |
| 1948 | Q.49 Pl. | 42·1 | 6·38 | 44·9 | 6·88 |
| 1949 | Q.49 1st R. | 30·7 | 4·15 | 29·7 | 4·08 |
| 1950 | Q.49 2nd R. | 37·4 | 4·54 | 37·1 | 4·47 |
| 1952 | Q.49 Pl. | 22·8 | 2·78 | 22·9 | 2·76 |
| 1953 | Q.49 1st R. | 43·4 | 5·93 | 38·7 | 4·95 |
| 1954 | Q.49 2nd R. | 38·8 | 5·29 | 34·4 | 4·82 |
| | | 452·9 | 64·48 | 443·9 | 62·89 |

### Trash-Fertilizer-Legume Trial

The plant crop of this fertilizer and plant residue trial was harvested during the year, thus commencing the fifth cycle of this experiment which was inaugurated in March, 1938. The trial area is divided into six blocks, and on two of these the trash is burnt at harvesting and no green manure crop is grown during the fallow; on another two the trash is also burnt but a green manure crop is grown before planting cane, while on the remaining two blocks the trash is turned into the soil and a green manure crop also grown. Superimposed on these broad treatments is a fertility trial which includes K, PK, NK and NPK dressings. The performance of each fertilizer is then noted in relation to the broad cultural treatments. In the plant crop of this rotation the broad treatments "green-manure" and "trash plus green-manure" were significantly superior to "trash burnt and no green manure." However, this merely reflects the nitrogen supply of the green manure crop as contrasted with a bare fallow. It was interesting to find, in this crop, a response to P; a deficiency of this plant food is rarely recorded on this soil type.

### Nitrogen Trial

This trial, planted in the autumn of 1952, to assess the value of applying sulphate of ammonia top dressing in more than one application, and at different times, advanced a stage further with the first ratoon harvest in 1954. After harvesting the plant crop Sugar Bureau No. 3 planting mixture was applied to the ratoon stools, and 300 lb. of sulphate of ammonia per acre, as follows, when the shoots were well established.

1. 300 lb. in December.
2. 150 lb. in November + 150 lb. in December.
3. 100 lb. in November + 100 lb. in December + 100 lb. in January.
4. 75 lb. in November + 75 lb. in December + 75 lb. in January + 75 lb. in February.

Two varieties, Q.50 and C.P.29/116, which represent a high percentage of district crop production, are grown in this trial, and first ratoon results follow a pattern somewhat similar to that obtained from the plant crop. Q.50 again demonstrated its superiority over C.P.29/116 for early harvesting when juice analyses were carried out in June, July and August.

**Fig. 36—Erosion caused by the Maryborough flood denuded this Q.50 of soil. The stools all fell at right angles to the cane row.**

**Fig. 35—After the Maryborough flood in 1955. Cane tops have been removed by the flood waters as if severed by a knife.**

Yield results showed that treatments 1, 2, 3 and 4, for both varieties, significantly outyielded the untreated control at the one per cent. level. There is a suggestion that the single application of sulphate of ammonia in December produced a lower yield than the later and split dressing, but there were no differences between treatments 2, 3 and 4.

### Trial Initiated

During the autumn of 1955 a trial was established with ratoon stunting disease-free stocks of some of the older canes—P.O.J.2878 and M.1900S. —which lost favour because of alleged "running out", and some of the present commercial varieties —Q.47, Q.50, C.P.29/116, Pindar, Vesta and N.Co.310. The canes are now well grown and useful information should be available when this trial is harvested. At the same time stocks of D.1135, Q.813, P.O.J.2714 and other old favourites are being built up for the same purpose.

### Annual Field Day

The annual Field Day, held on the Experiment Station in May, 1955, was attended by a record number of persons. Some 650 people consisting of cane growers, mill officers and other persons associated with the industry inspected the Station and showed keen interest in seedling raising, varietal testing and other investigational work.

### Laboratory Work

Following is a summary of cane and water samples handled during the year:—

| | |
|---|---|
| Station and trial cane samples | 999 |
| Farmers' cane samples | 272 |
| Irrigation waters | 19 |

### Summary of Crops Grown on Station

Varieties harvested, 1954 season.

| | | |
|---|---|---|
| Seedlings | 477.53 | tons |
| Q.50 | 316.87 | ,, |
| Q.49 | 123.16 | ,, |
| P.O.J.2878 | 122.54 | ,, |
| C.P.29/116 | 115.18 | ,, |
| Q.47 | 20.7 | ,, |
| Pindar | 4.5 | ,, |
| M.1900S. | 4.5 | ,, |
| Vesta | 4.0 | ,, |
| N.Co.310 | 3.0 | ,, |
| Q.813 | 0.5 | ,, |
| Total | 1192.48 | ,, |
| Plant cane harvested | 410.5 | tons |
| Ratoon cane harvested | 781.98 | ,, |
| Total | 1192.48 | ,, |
| Total cane harvested for mill | 1138.85 | tons |
| Used for samples and plants | 53.63 | ,, |
| Total | 1192.48 | ,, |
| Total acreage harvested | 29.81 | acres |
| Average tonnage per acre | 40.00 | tons |

# Division of Plant Breeding

(J. H. Buzacott, Senior Plant Breeder)

## Introduction

The plant breeding staff was further increased early in 1955 by the appointment of Mr. G. Barrie as Assistant Agronomist to assist with the cane breeding and to initiate a legume breeding programme. An increased amount of investigational work was carried out during the year, and the receipt of valuable equipment has assisted the research programme considerably. The conversion house was completed but initial troubles in its operation prevented its use for increasing pollen fertility; however, it will be available for use in July during the seedling germination period. For the photoperiodic induction of flowering a dark room was completed and will be available for use as soon as the activities of the staff can be directed towards this work. Delivery was taken of a modern well-equipped microscope which has greatly

**Fig. 37—The 1955 polycross containing 326 arrows.**

of a residence to a new laboratory was completed in recent months, and the plant breeding and entomological staffs moved into occupation towards the end of June. Apart from relieving the staff congestion which was occurring in the old laboratory, the new one is particularly appreciated as affording a much better lighted laboratory for microscope work, and a spacious fuzz packing room which has been badly needed for many years. The installation of electrical heating in the glass-assisted cytological investigations, whilst the purchase of a new camera and efficient enlarger have enabled photographic work to be carried out at an increased tempo.

During the coming year provision has been made for the purchase of an electric soil sterilizer which is expected to reduce considerably the amount of labour occupied by the present soil sterilization methods, as well as giving more accurate control of temperature.

## Cross Pollination

Owing to the extended wet season and showery weather, which continued until the end of June, 1955, the arrowing was the most extensive experienced for years, was earlier than usual and the cross pollination season was short. The first crosses were commenced on the 13th May and by the end of that month 248 crosses were in progress. The final cross was set up by the end of June, bringing the total to 405 bi-parentals and six selfs. In addition, the arrows of 67 varieties from a polycross were saved for seed. The *spontaneum* Tukuyu

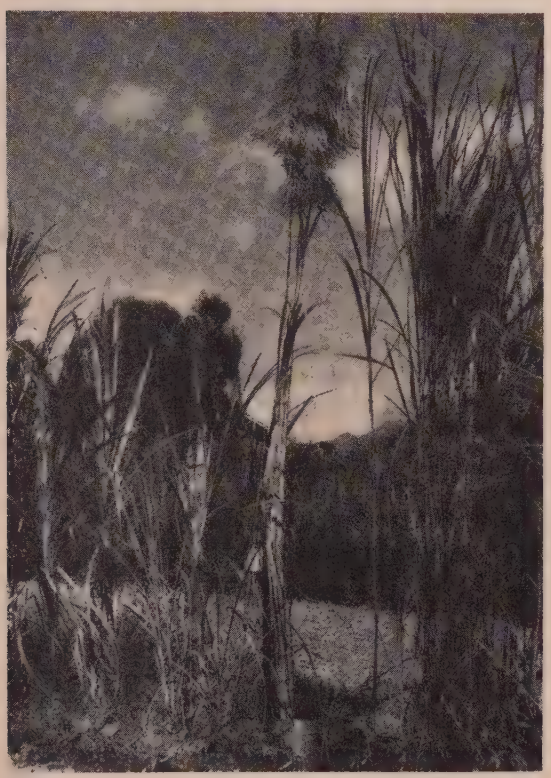


**Fig. 38—A cross with Tukuyu *spontaneum* and Q.27. Burma *spontaneum* is showing on right of picture.**

No. 2, a recent introduction, was used in three crosses, and other varieties used as parents at Meringa for the first time included J.125, N.Co's. 291, 292, 339, 349, 51N.G.17 and U.S.48/34. Also five Q.B.53 varieties, which are first nobilisations of the *robustum* 51N.G.140, were again nobilised. Bi-parental crosses and selfs are listed in Table VIII, whilst varieties saved for seed from the polycross are shown in Table VIIIa.

## Tests of Lantern and Open Crossing

During the 1955 cross-pollination a rigid testing programme was carried out to determine the degree of protection which is afforded by voile covered lanterns from fertilization by foreign pollen. Simultaneously the same tests were also applied to the open crossing stands which are dispersed through forest lands. The tests disclosed that neither the lantern crosses nor the dispersed open crosses were absolutely safe from fertilization by stray pollen and, for future years, some revision of the protection methods will have to be made. For the production of those selfs and crosses, in which it is absolutely necessary that there is no possibility of contamination, vegetable parchment bags have been used for the past two years for enclosing the arrows.

## Maleic Hydrazide

Maleic hydrazide has been effectively used at Meringa during recent years to delay arrowing. In addition to this use the chemical was tested during 1955 in a weaker solution as a spray to induce arrowing in a sparse flowering variety. Solutions ranging from .005 per cent. to 1.0 per cent. proved unsuccessful for this purpose. Indications were found, however, that applications of maleic hydrazide to sugar cane may increase the sugar content. Although the experiments were conducted on too small a scale for significant results the tests indicated that applications of one, two and four per cent. solutions of maleic hydrazide, made during March, produced by the end of April a marked increase in sucrose content in ratio to the solution strength. However, the more concentrated solutions markedly depressed the growth of the cane. A further experiment was commenced in May, 1955, and although a slight yellowing of the spindle of the cane occurred there has been no visible depression in growth from this later application. Sucrose figures from the May trials are not yet available.

A simple experiment to test the effect of maleic hydrazide on nut grass (*Cyperus rotundus*) gave promising results. A small area of land with a heavy growth of nut grass was sprayed during April, 1955. A few days later the sprayed area and the adjoining unsprayed area were hoed to remove surface growth. A month later, as shown in the illustration (Fig. 16), there was a well-

established stand of nut grass on the check plot and only an odd plant of nut grass developed on the sprayed section. At the time of writing, 16 weeks after the original spray application, this excellent control of the nut grass has still been maintained.

### Standover Flowering Trials

A number of varieties which do not normally flower in North Queensland, such as B.208, B.H.10/12, Loethers, Q.57, R.P.8 and Toledo, amongst others, were planted during 1954 in a small block where they can be allowed to grow for two years. It will be of interest to note whether these varieties flower more readily in the standover crop since, at least at Meringa, this is a feature of Burma *spontaneum*. This variety will not flower at Meringa in normal seasons until the second year of its growth.

### Germination Trials

Many of the crosses made in any season do not set seed, and consequently, when the fuzz is planted, no seedlings result. In order to reduce the labour necessary for the preparation of flats and the planting of many batches of fuzz which will not produce seedlings, trials were conducted to determine the value of planting pilot lots of fuzz of each cross with a view to discarding crosses which will not germinate. Germination of seed on damp cotton wool, in Petri dishes, provided a satisfactory method, and a high degree of correlation with parallel plantings in flats was achieved. This method will be adopted in future years to discard fuzz from which low or nil germination can be expected.

### Bunch Planting

Bunch-planting of seedlings was carried out both in 1953 and 1954 with a view to making comparisons between the methods of bunch-planting and space-planting under Queensland conditions. From the 1953 bunch-planted seedlings, selections were made of the 100 best stalks, 100 average stalks and the 50 worst stalks and these were planted in comparison with a planting of 50 random selections from space-planted seedlings of the same cross. The resultant crop was examined in 1955 and the indications were that the progeny from the best 100 stalks from the bunch-planted seedlings was, on the average, better than that from the other three categories. Further experiments have now to be established to determine whether the improvement effected is sufficient to compensate

**Fig. 39—In the centre section of this photograph—adjacent to the pole—arrowing has been delayed by the electric light.**

for the extra labour associated with raising the large numbers of seedlings necessary for bunch-planting when compared with the fewer seedlings required for space-planting.

### Sub-stations

Seedling raising sub-stations (as distinct from the Experiment Stations) were maintained at Babinda, Mackay and Nambour, and arrangements were made to establish a further one at

**Fig. 40—Stalk of cane marcotted with pliofilm bag. Root development can be seen within the bag.**

Mourilyan during 1955. The Innisfail district is already partially served by the Babinda sub-station. This is situated on the red volcanic soil type at Bartle Frere, which is also representative of the Innisfail red volcanic soils. The Mourilyan sub-station will be more representative of the non-volcanic soil types of the Innisfail-Tully district, and consequently should provide an adequate supplement to the Babinda sub-station.

### Low Land Varieties

The project of selecting varieties for the rich, flooded soil types, where most varieties lodge and produce low sugar, has been continued and several promising varieties are now in propagation. Q.57, placed on the approved lists of some northern mill areas in 1955, has performed well on rich land and very few crops of it have lodged. Its drawbacks are a proneness to suckering and a habit of lodging if subjected to a fierce burn. One of the most promising varieties selected for rich land is I.233, which has not yet received a "Q" number. Even under the most severe conditions this variety does not lodge, and it offers considerable promise as a special purpose variety for rich, low land. A point of interest is that this variety, which is so resistant to lodging and which arrows rather sparsely, was used in 16 bi-parental crosses this year in an endeavour to obtain other varieties of the same type. Several other varieties with high early sugar and an erect habit are undergoing trials on rich land, and it is felt that in the very near future some relief will be offered to growers on those soils where most present commercial varieties make cane growing less economic than it should be.

### Badila Varieties

Five of the segregated Badila types which were referred to in the 1954 Annual Report were planted in a randomised trial in 1954. Growth measurements this year on the grown crop support the visual impression that "Thick Badila" is thicker in the stalk than any other of the varieties, whilst Badila Seedling and Oba Badila are thinner and longer in the stalk than the others. The two last-mentioned varieties lodged. The trial was not harvested until July, 1955, but since the results of it are to hand before this report was written it is interesting to record that "Thick Badila" outyielded the other types under test by approximately three tons per acre. Since "Thick Badila" resists lodging better than the other types it seems certain to find a place on the better soils. In observational plantings of two other Badila varieties which have been segregated, both lodged badly and a close examination of them will not be possible until next year.

### Fodder Canes

The selection of possible fodder canes for testing by the Department of Agriculture was continued,

Fig. 41—The best anti-lodging variety yet produced. This is I.233 and the photograph was taken from the lodged Badila plot.

Fig. 42—A fine stool of K.641, a rich land variety in a yield observation trial on Meringa.

Fig. 43—The seedling I.222, one of the promising new varieties produced at Meringa.

and eleven soft-stalked leafy varieties, all of the parentage Co.419 x Co.331, were despatched to the Regional Experiment Station of the Department of Agriculture and Stock at Kairi during August, 1954.

### Legume Breeding

The planting of legume crops in cane lands during the fallow period is standard practice in most parts of Queensland. Many of the varieties of legume which it has been customary to use in the past, such as Black, Clay, Giant and Poona cowpeas, have become susceptible to *Phytophthora* and *Fusarium* wilts and cannot be grown successfully in tropical areas on that account. With a

**Fig. 44—Cross pollinating legumes in the legume breeding plot at Meringa.**

view to providing replacement varieties which are resistant to wilts a legume breeding project was commenced at Meringa during 1955. A collection of parent legumes is the initial step in the project and it is hoped to commence the major cross-pollination work during the late spring months so that seed can be collected before the onset of the wet season.

### Cytogenetical Investigations

The cytogenetical investigations which were commenced in the previous year were continued, but were considerably interrupted by the necessity of using the Technical Officer engaged in the studies for other urgent work connected with seedling raising. Delivery was taken of a modern microscope with built-in light source which has given every satisfaction. Attention was devoted to the perfection of technique with the result that good slides of both root squashes and pollen mother

**Fig. 45—Cytological work at Meringa, a necessary accompaniment to genetics and cane breeding.**

cell smears are now obtained. For root tips Feulgen squashes stained with aceto-carmine have been used up to the present, whilst simple aceto-orcein smears are used for pollen mother cells. The aceto-orcein gives darker staining of the chromosomes and has only recently been adopted for pollen mother cells. Aceto-orcein has not yet been used for root-squashes.

There is little difficulty in counting metaphases of root tip smears of noble varieties such as Badila, in which only 80 chromosomes occur. It is not, however, easy to make accurate counts of the smears of hybrids which have a far greater number of chromosomes; nor is it easy to make counts on

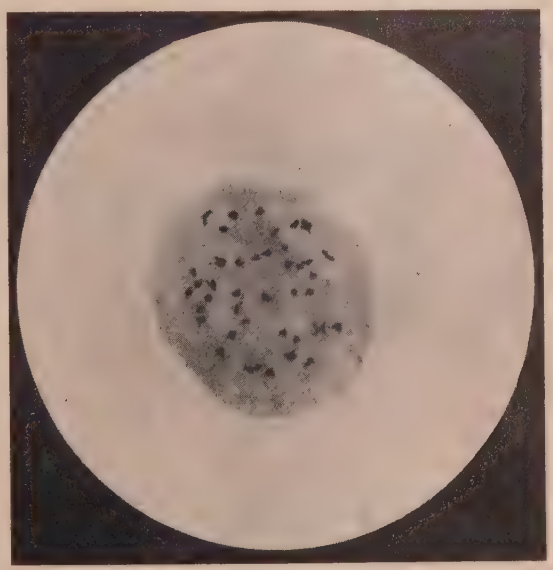


**Fig. 46—Photomicrograph of a pollen mother cell of the variety 51N.G.63.**

pollen mother cells of hybrids in which multivalent chromosomes occur. This work will be continued when more unbroken time can be devoted to it; in the meantime it is interesting to note that Dr. Price of the United States has found that two of the *robustum* varieties collected by the 1951 New Guinea expedition, viz., 51N.G.91 and 51N.G.106,

**Fig. 47—A sugar cane anther showing viable pollen stained with iodine.**

have a chromosome count of the order of 2n=161 and 2n=196 respectively. Only one of the 1951 New Guinea *robustums* has so far been counted at Meringa. This is 51N.G.63, which has given a count of 2n=80—82. This is in agreement with counts of others of the New Guinea *robustums* which have been recorded by Dr. Price.

### Photography

The continual demand for photographs related to experimental work and for the illustration of Bureau publications has led to the formation of a photographic section associated with the Division of Plant Breeding. It is well equipped with cameras and enlarging apparatus and is now coping well with the extremely varied types of photography required, ranging from photomicrographs to pictorial illustrations for demonstration purposes and agricultural shows.

### Interstate and Overseas Visits

During December, 1954, the Senior Geneticist visited Canberra and Sydney for the purpose of discussion with prominent geneticists of the Commonwealth Scientific and Industrial Research Organization. In February, March and April, 1955, the Senior Plant Breeder visited the Philippine Islands, India, Mauritius and South Africa to observe cane breeding work and other activities associated with the growing of sugar cane in those countries.

## VARIETAL STATISTICS

Once again there was a record tonnage of cane harvested in the State of Queensland and the total crushed in 1954 approached ten million tons. An increase was recorded in every section of the State, due in large degree to the increased area harvested following the expansion programme in the industry. At the same time it was to some extent due to the further extension of hybrid varieties, particularly Q.50 and Pindar, at the expense of the comparatively few noble varieties such as Badila, Comus and S.J.16 which still provide an appreciable percentage of the total crop.

### Q.50—Again Premier Variety

Q.50 maintained the honour it gained in 1953 as the premier variety in the State. It exceeded its nearest competitor by almost half a million tons and, with a total 1954 tonnage of some 2,804,000, it almost acquired the honour of being the first variety in Queensland to exceed a three million ton crop in a single year. The 1955 crop promises to be much lighter throughout the State than the 1954 crop and, if so, it is likely Q.50 will never reach the three million ton mark in one year, since it is anticipated that in the near future new releases in the Mackay district will gradually reduce the Q.50 tonnage harvested. The percentage of Q.50 harvested in the central district has increased to the all-time high of 84.2 per cent. and in one mill area it provided 93.2 per cent. of the crop. It is realised that such a high percentage of one variety could lead to disaster should there occur an outbreak of a serious disease to which that variety is susceptible. It is expected that the recently approved varieties C.P.29/116 and Q.58, particularly the latter, should replace a portion of the Q.50 now grown, whilst the probable approval of Q.56 in the near future may further assist to reduce the undesirably high proportion of Q.50. A further record achieved by Q.50 in 1954 is that it is the first single variety ever to produce more than two million tons in one year in the

central district. Apart from its performance at Mackay and Proserpine, Q.50 has increased in popularity both north of Townsville and in the Bundaberg district. It has become a major variety in the Ingham Line section of the Invicta Mill, contributed over 20 per cent. of the Hambledon crop and reached 16 per cent. of the Mulgrave harvest. In the southern district, with a production of 388,000 tons, it now ranks second in importance and is exceeded in tonnage only by C.P.29/116.

**Fig. 48—The seedling K.641 on the right and Badila on the left showing the former's resistance to lodging. The stool in the right foreground is I.233.**

**Fig. 49—Looking over Meringa 40-sett plots, 1955. Note the heavy arrowing of some of the varieties.**

### Pindar Displaces Trojan

A major change in the varietal rating occurred when Pindar displaced Trojan for second place and, in doing so, it became the second variety to exceed a production of two million tons in one year. On this account 1954 became the first year in which two varieties exceeded the two million ton figure in the same year. Pindar, like Q.50, is well distributed throughout the State, but its major stronghold is north of Townsville, where last year it represented 45 per cent. of the crop. It also provided a very important 20 per cent. of the Burdekin crop. In 1955 Pindar could easily replace Q.50 as the premier variety, but if it does it is quite likely that Q.50 will regain that position in 1956, as there is some recession in plantings of Pindar in the wetter districts of Babinda and Innisfail. This is due to the low sugar and pithiness of the variety during this year of heavy rainfall. Also in the Burdekin district Q.57 has been planted to a degree which might influence the tonnages of Pindar produced. However the prolific crops of Pindar grown in some northern districts after hot-water treatment make future top rankings difficult to prophesy.

### Decline of Trojan

Apart from being displaced by Pindar, Trojan, in dropping back to third position, declined slightly in its percentage of the total crop. This decline was very marked north of Townsville, where it fell from 24.3 per cent. in 1953 to 18.2 per cent. in 1954. On the other hand it fully maintained its popularity in the Burdekin district, where it represented 60 per cent. of the total crop.

C.P.29/116 once again slightly exceeded one million tons and ranked fourth with approximately the same crop as in the previous year. This, however, represented a slightly lower percentage of the total crop, and there is little doubt that Q.50, as the variety of second importance in the Bundaberg district, is now a serious competitor.

### Gradual Displacement of Badila

Badila, for so many years the premier variety, produced only slightly less tonnage in 1954 than in the previous year, but in doing so declined a further one per cent. in its proportion of the total crop. It represented only 7.8 per cent. of the State crop compared with the figure of 37 per

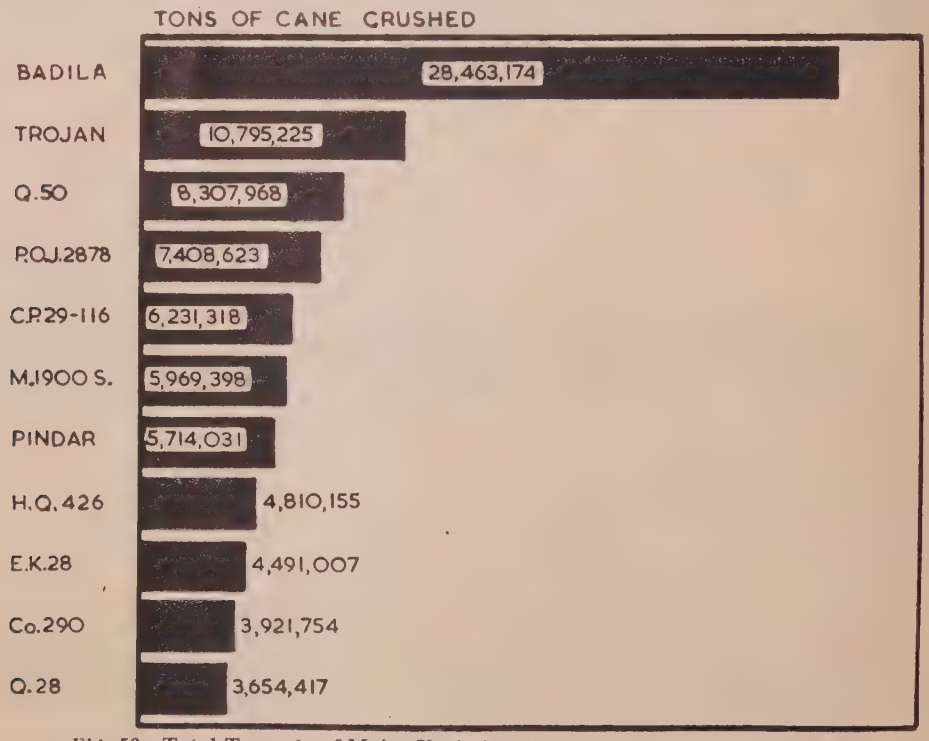



**Fig. 50—Total Tonnage of Major Varieties of Cane Crushed from 1934-1954.**

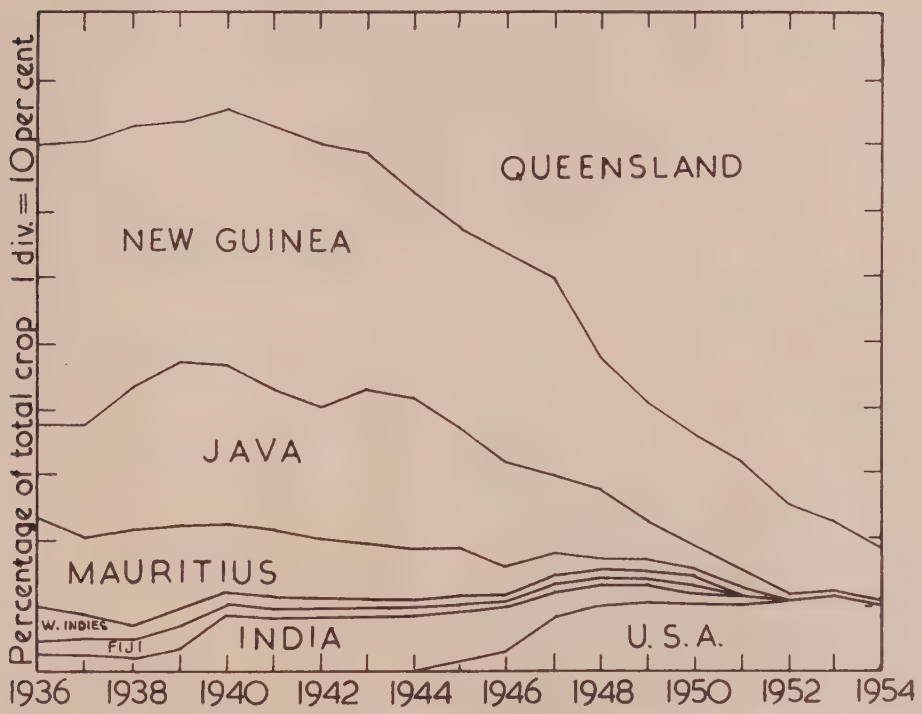



Fig. 51—The Composition of the Queensland crop on the basis of the country of origin from 1936 to 1954.

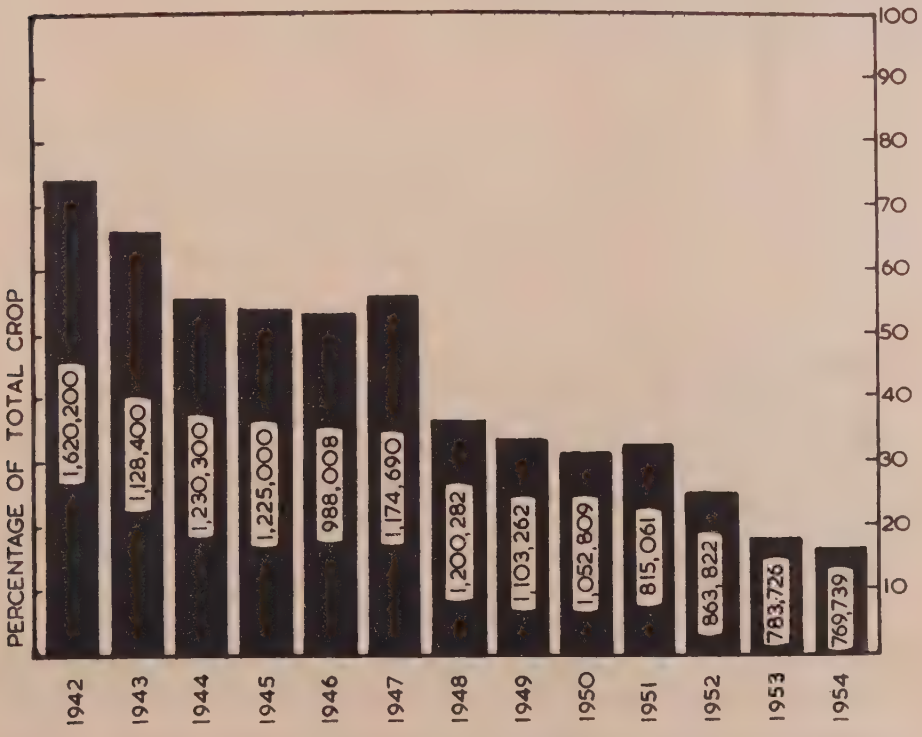



Fig. 52—Decline of Badila in percentage of total Queensland crop and tons crushed in each year 1942 to 1954.

cent. twelve years ago. Badila is still a favoured variety in the Innisfail district and it will be a long time before it is replaced there.

### The Less Important Varieties

Of the remaining 34 varieties shown in the table of the varietal composition of the 1954 harvest, Comus was the only one to exceed two per cent. of the total crop, and that by a very small margin; it has declined slightly in popularity. Only five other varieties—Eros, Q.47, S.J.16, Q.28 and Q.44—exceeded one hundred thousand tons, and of these Q.28 shows signs of regaining some of its former popularity in the Mackay district by more extended plantings of it during 1954 and 1955. This is due to the restoration of its original vigour by hot-water treatment.

**Fig. 53—A row of selfs (centre) produced in the Meringa cane breeding programme.**

Newer varieties which have shown a considerable increase in tonnage harvested are Q.55, Ragnar, Vesta and Vidar, whilst varieties which are showing a gradual decline are Cato, Co.290, H.Q.426, M.1900 Seedling, Pompey, Q.45 and S.J.2.

### Queensland Bred Canes Reach Four-fifths of Crop

The steady rise in the percentage of Queensland bred canes is shown by an increase from slightly better than three-quarters of the total crop in 1953 to four-fifths of the total in 1954. This was at the expense of a slight decline in the percentage of varieties from each other country represented with the exception of South Africa which, due to the propagation of N.Co.310, showed a slight increase.

**Fig. 54—Finalising the 1955 planting of the new seedling sub-station at Mourilyan. Over 1,000 seedling varieties were planted there this year.**

This latter variety, with its high early sugar, should extend in southern and possibly in the central districts and will ensure South Africa's representation in the varietal picture for some years to come. The approval of C.P.29/116 for the central district mills will compensate to some extent for the slight recession of that variety in the south due to the extension of Q.50 plantings, and U.S. varieties will accordingly continue to provide some 10 per cent. of the crop. P.O.J.2878, E.K.28, and P.O.J.2725 represent the Javan varieties, but the lastmentioned is no longer on the approved list of any mill area. P.O.J.2878 is, however, still important in the Bundaberg and Mackay districts, although E.K.28 is fast declining in importance. The Indian representatives, Co.290 and Co.301, are slowly decreasing in plantings and unless Co.475 shows sufficient resistance to red rot in North Queensland to be approved at some future date it looks as if Indian representation is gradually dying out. Mauritius, represented by M.1900 Seedling, Fiji by Pompey, and the West Indies by B.208, together scarcely provide one per cent. of the crop and have reached almost negligible proportions. It is only a matter of time before these countries are no longer represented on the lists of approved varieties.

**Table VII**
**Countries of Origin: 1954 Crop**

| Country of Origin | Tons of Cane | per cent. |
|---|---|---|
| Queensland | 7,919,225 | 80·3 |
| U.S.A. | 1,019,210 | 10·3 |
| New Guinea | 780,651 | 7·9 |
| Java | 104,713 | 1·1 |
| India | 21,632 | 0·2 |
| South Africa | 8,264 | 0·1 |
| Fiji | 4,775 | |
| Mauritius | 4,711 | 0·1 |
| West Indies | 1,124 | |
| | 9,864,305 | 100·0 |

**TABLE VIII**
**List of Bi-Parental Crosses made during 1955 Season**

| | |
|---|---|
| Badila | x Co.290, Comus, F.134, G.269, G.323, G.362, I.211, P.O.J.2878, Q.27, Q.28. |
| Castor | x Q.27. |
| Co.270 | x Eros, F.134, Korpi, P.O.J.2878, Q.39, Vesta. |
| Co.281 | x Eros, P.O.J.2878. |
| Co.290 | x Eros, G.362, P.O.J.2878, Q.27, Q.39. |
| Co.301 | x P.O.J.2878. |
| Co.331 | x Eros, Pompey, Q.27. |
| Co.419 | x Co.281, Co.331, C.P.44/155, Eros, G.331, P.O.J.2940, Pompey, Q.27, Q.34, Q.36, Q.39. |
| Co.421 | x Co.331, P.O.J.2878. |
| Co.475 | x Badila, Comus, Eros, G.331, G.362, I.233, Korpi, P.O.J.2878, Q.27, Q.28, Q.36, Q.39, Trojan. |
| C.P.29/320 | x Eros. |
| C.P.34/120 | x P.O.J.2878. |
| C.P.36/105 | x Eros. |
| C.P.50/11 | x P.O.J.2878, Trojan. |
| D.209 | x Badila, Co. 290, Co.331, Eros, G.331, Korpi, K.5, K.690, P.O.J.2878, Q.28, Q.36, Q.39. |
| D.285 | x Comus, Co.270, Co.290, Co.331, E.P.C.38/304, Q.27, Q.28, Q.36, Q.39, U.S.48/34. |
| Eros | x Co.270, Co.281, Co.290, Co.331, Co.475, C.P.36/105, C.P.44/101, F.134, G.250, G.331, N.Co.310, P.O.J.2878, Pompey, Q.27, Q.28, Q.39, Uba Marot. |
| G.253 | x Eros, P.O.J.2878, Pompey, Q.36. |
| G.263 | x Comus, Co.290, Co.331, Pompey, Q.39, Vesta. |
| G.323 | x Badila, I.233, Q.27. |
| G.324 | x Comus, Co.290, Eros, P.O.J.2878, Q.27, Q.28, Q.39, Trojan. |
| G.326 | x Comus, Korpi. |
| G.362 | x Badila, Comus, Co.290, Co.475, P.O.J.2878, Q.27. |
| H.265 | x Comus, Eros. |
| H.364 | x Comus, Q.28. |
| H.31–1389 | x Trojan. |
| H.32–3575 | x Co.331, C.P.44/101. |
| I.106 | x Comus. |

| | | |
|---|---|---|
| I.209 | x | Badila, Comus, Eros, G.323, P.O.J.2878, Q.27, Q.28, Q.39. |
| I.210 | x | Badila, Comus, Eros, Q.27. |
| I.211 | x | Badila, Comus, Korpi, P.O.J.2878, Q.28. |
| I.216 | x | Badila, Comus, Q.27, Q.28, Q.39. |
| I.233 | x | Comus, Co.475, Eros, G.323, G.331, G.362, Korpi, K.690, P.O.J.2878, Pompey, Q.27, Q.28, Q.36, Q.39, Trojan. |
| J.125 | x | P.O.J. 2878, Q.28. |
| J.331 | x | Q.39, 39S.N.3821. |
| J.334 | x | G.331. |
| J.337 | x | Comus, E.282, Eros, F.134, G.331, Korpi, P.O.J.2878, P.O.J.2940, Q.27, Q.28, Q.36, Q.39 |
| Korpi | x | I.211, Q.27. |
| K.696 | x | Badila, Co.331, Eros, G.269, G.331, G.362, I.216, K.5, P.O.J.2878, Q.27, Q.28, Trojan. |
| Luna | x | Badila, Comus, Q.27, Q.28, Q.39. |
| N.Co.291 | | 39S.N.3821. |
| N.Co.292 | x | G.331, Pompey, Q.39. |
| N.Co.310 | x | Co.331, C.P.29/116, C.P.36/105, C.P.36/111, C.P.44/101, Eros, F.134, G.331, P.O.J.2878, P.O.J.2940, Pompey, Q.28, Q.36, Q.39, 39S.N.3821, Uba Marot. |
| N.Co.339 | x | 39 S.N.3821. |
| N.Co.349 | x | 39S.N.3821. |
| Pindar | x | Q.39. |
| P.O.J.2725 | x | Co.281, Co.331, C.P.36/105, C.P.44/101, G.250, Q.36. |
| P.O.J.2875 | x | Comus, Co.270, Co.290, Co.301, Co.331, C.P.36/105, C.P.44/101, Eros, G.331, Pompey, Q.28, Q.39. |
| P.O.J.2878 | x | Badila, C.4–6, Co.270, Co.281, Co.290, Co.301, C.P.36/105, C.P.36/111, C.P.44/101, C.P.48/103, C.P.50/11, Eros, F.134, G.250, G.253, G.331, G.362, I.211, I.233, J.125, K.690, N.Co.310, 51N.G.91, P.O.J.2940, Pompey, Q.27, Q.28, Q.39, 39S.N.3821, U.2.48-34. |
| P.O.J.2883 | x | Comus. |
| Pompey | x | Comus, Co.331, C.P.44/101, C.P.44/155, Eros, G.250, Q.28, Q.39, Q.B.53–36, Uba Marot. |
| Q.13 | x | Badila, Eros, G.269, G.323, P.O.J.2878, Q.27. |
| Q.27 | x | Badila, Comus, Co.290, Co.331, Eros, G.323, G.362, Korpi, P.O.J.2878, Q.39. |
| Q.28 | x | Co.331, Co.475, Eros, I.211, Pompey. |
| Q.37 | x | P.O.J.2940. |
| Q.42 | x | P.O.J.2878. |
| Q.44 | x | Badila, Comus, G.250, G.362, J.B.3, Korpi, 51N.G.17, Q.27. |
| Q.47 | x | F.134, Pompey, Q.39, Vesta. |
| Q.49 | x | Comus. |
| Q.50 | x | Comus, Eros, F.134, J.B.3, P.O.J.2878, Q.28, Q.36, Q.39, 39S.N.3821. |
| Q.59 | x | Badila, Eros, Q.39. |
| S.J.4 | x | F.134, G.269, Q.28. |
| 38S.N.4305 | x | C.P.44/101, C.P.48/103, Eros, P.O.J.2878. |
| Trojan | x | Badila, Comus, Co.290, Co.331, Co.475, C.P.50/11, Eros, F.134, G.250, G.270, G.323, G.331, G.362, H.31-1389, I.216, I.233, J.B.3, Korpi, P.O.J.2878, P.O.J.3016, Q.27, Q.28, Q.36, Q.B.53–33, Q.B.53–36, Q.B.53–39, Q.B.53–45, Q.B.53–52, Vesta. |
| Tukuyu No. 2 | x | P.O.J.2878, Pompey, Q.27. |
| Uba Marot | x | Eros. |
| Vidar | x | Badila, Comus, Co.290, Co.331, Eros, G.331, G.362, Korpi, P.O.J.2878, Q.27, Q.28, Q.39, Vesta. |
| Selfs | of | Korpi, Q.B.53–13, Q.B.53–16, Q.B.53–26, Q.B.53–32, and Q.B.54–1. |

## TABLE VIIIa

### Female Parentage of Seed Saved from Polycross 1955 Season

| | | | |
|---|---|---|---|
| B.4098 | F.31–962 | J.331 | Q.13 |
| B.O.29 | G.263 | J.334 | Q.27 |
| Comus | G.270 | J.337 | Q.28 |
| Co.270 | G.297 | Luna | Q.36 |
| Co.281 | G.323 | M.336 | Q.37 |
| Co.290 | G.326 | M.165–38 | Q.39 |
| Co.331 | G.331 | 33M.Q.371 | Q.42 |
| Co.419 | G.362 | 39M.Q.832 | Q.47 |
| Co.421 | H.130 | N.Co.291 | Q.49 |
| Co.475 | H.265 | N.Co.292 | Q.50 |
| C.P.29/320 | H.312 | Orion | Q.52 |
| C.P.33/409 | H.32–8560 | Pindar | S.J.4 |
| D.209 | H.39–5803 | P.O.J.2725 | 40S.N.1133 |
| D.285 | H.51–9037 | P.O.J.2875 | 40S.N.5819 |
| D.286 | I.216 | P.O.J.2878 | 41S.N.3339 |
| Eros | I.233 | P.O.J.2940 | Trojan |
| E.256 | I.P.190 | Pompey | |

## Table IX

**Varietal Composition and Distribution in the Four Main Districts and in the State as a whole—1954 crop**

| Variety | North of Townsville | | Burdekin and Giru | | Proserpine and Mackay | | Bundaberg and South | | Whole State | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Tons | % | Tons | % | Tons | % | Tons | % | Tons | % |
| 1. Q.50 .. .. | 206,839 | 5·1 | 4,921 | 0·2 | 2,203,541 | 84·2 | 388,284 | 21·6 | 2,803,585 | 28·4 |
| 2. Pindar .. .. | 1,847,463 | 45·7 | 274,994 | 19·6 | 117,086 | 4·5 | 73,928 | 4·1 | 2,313,471 | 23·5 |
| 3. Trojan .. .. | 734,537 | 18·2 | 854,330 | 60·8 | 22,736 | 0·9 | 4,142 | 0·2 | 1,615,745 | 16·4 |
| 4. C.P.29/116 .. | .. | .. | .. | .. | 27,682 | 1·1 | 991,528 | 55·0 | 1,019,210 | 10·3 |
| 5. Badila .. .. | 695,611 | 17·2 | 67,830 | 4·8 | 6,298 | 0·2 | .. | .. | 769,739 | 7·8 |
| 6. Comus .. .. | 116,702 | 2·9 | 72,705 | 5·2 | 31,011 | 1·2 | .. | .. | 220,418 | 2·2 |
| 7. Eros .. .. | 164,399 | 4·1 | .. | .. | .. | .. | .. | .. | 164,399 | 1·7 |
| 8. Q.47 .. .. | .. | .. | .. | .. | .. | .. | 145,885 | 8·1 | 145,885 | 1·5 |
| 9. S.J.16 .. .. | .. | .. | 110,962 | 7·9 | .. | .. | .. | .. | 110,962 | 1·1 |
| 10. Q.28 .. .. | .. | .. | .. | .. | 105,155 | 4·0 | 4,833 | 0·3 | 109,988 | 1·1 |
| 11. Q.44 .. .. | 104,640 | 2·6 | .. | .. | .. | .. | .. | .. | 104,640 | 1·1 |
| 12. P.O.J.2878 .. | 692 | .. | 2,275 | 0·2 | 53,276 | 2·0 | 32,879 | 1·8 | 89,122 | 0·9 |
| 13. Vidar .. .. | 47,948 | 1·2 | .. | .. | .. | .. | .. | .. | 47,948 | 0·5 |
| 14. Q.55 .. .. | .. | .. | .. | .. | .. | .. | 42,987 | 2·4 | 42,987 | 0·4 |
| 15. Vesta .. .. | .. | .. | .. | .. | .. | .. | 41,466 | 2·3 | 41,466 | 0·4 |
| 16. H.Q.426 .. | 19,695 | 0·5 | 5,395 | 0·4 | 2,165 | 0·1 | .. | .. | 27,255 | 0·3 |
| 17. S.J.4 .. .. | 27,121 | 0·7 | .. | .. | .. | .. | .. | .. | 27,121 | 0·3 |
| 18. Ragnar .. .. | 27,094 | 0·7 | .. | .. | .. | .. | .. | .. | 27,094 | 0·3 |
| 19. Q.49 .. .. | .. | .. | .. | .. | .. | .. | 26,541 | 1·5 | 26,541 | 0·3 |
| 20. Q.45 .. .. | .. | .. | .. | .. | 24,723 | 0·9 | .. | .. | 24,723 | 0·2 |
| 21. Cato .. .. | 24,600 | 0·6 | .. | .. | .. | .. | .. | .. | 24,600 | 0·2 |
| 22. E.K.28 .. .. | .. | .. | 7,145 | 0·5 | 8,328 | 0·3 | .. | .. | 15,473 | 0·2 |
| 23. Co.290 .. .. | .. | .. | .. | .. | 4,749 | 0·2 | 9,680 | 0·5 | 14,429 | 0·1 |
| 24. Q.51 .. .. | .. | .. | .. | .. | .. | .. | 10,920 | 0·6 | 10,920 | 0·1 |
| 25. Badila Sdg. .. | 10,912 | 0·3 | .. | .. | .. | .. | .. | .. | 10,912 | 0·1 |
| 26. N.Co.310 .. | .. | .. | .. | .. | 17 | .. | 8,247 | 0·5 | 8,264 | 0·1 |
| 27. Co.301 .. .. | .. | .. | .. | .. | .. | .. | 7,203 | 0·4 | 7,203 | 0·1 |
| 28. Pompey .. | 4,775 | 0·1 | .. | .. | .. | .. | .. | .. | 4,775 | |
| 29. M.1900 .. .. | .. | .. | .. | .. | 4,141 | 0·2 | 570 | .. | 4,711 | |
| 30. S.J.2 .. .. | .. | .. | 1,503 | 0·1 | 2,032 | 0·1 | .. | .. | 3,535 | |
| 31. Q.42 .. .. | .. | .. | .. | .. | .. | .. | 2,788 | 0·2 | 2,788 | 0·2 |
| 32. Q.57 .. .. | 906 | .. | 1,104 | 0·1 | .. | .. | .. | .. | 2,010 | |
| 33. Atlas .. .. | .. | .. | .. | .. | .. | .. | 1,333 | 0·1 | 1,333 | |
| 34. B.208 .. .. | .. | .. | 1,124 | 0·1 | .. | .. | .. | .. | 1,124 | |
| 35. Exp. and Others | 7,216 | 0·1 | 1,145 | 0·1 | 3,679 | 0·1 | 7,889 | 0·4 | 19,929 | 0·2 |
| | 4,041,150 | 41·0 | 1,405,433 | 14·2 | 2,616,619 | 26·5 | 1,801,103 | 18·3 | 9,864,305 | 100·0 |

# Division of Entomology and Pathology

## GENERAL

(R. W. Mungomery, Asst. to Director)

### Staff.

The Pathology Section was strengthened by the appointment of Mr. J. R. Pollock as Assistant Pathologist, and he commenced duties at the Brisbane laboratory early in 1955. Following this appointment it was intended to transfer Mr. B. T. Egan, Assistant Pathologist, to the Northern Sugar Experiment Station at Meringa, where he was due to undertake further investigations in connection with the more important sugar-cane diseases occurring in the northern areas. However, his transfer had to be temporarily deferred because of the departure of Mr. C. G. Hughes, Senior Pathologist, on an extensive visit to Britain, Europe and North America, where he is pursuing enquiries into the latest developments in plant pathological research at the leading universities and other scientific institutions of those countries. It is also pleasing to record that Mr. D. R. L. Steindl, Senior Pathologist, was about to resume duties in July of this year after an enforced period of absence through illness, so this branch can now look forward to a considerable expansion of its activities, both in regard to the volume of work undertaken and the range of sugar-cane diseases being studied.

### General.

The programme against ratoon stunting disease has continued as a top priority item—particularly on the control side—and stocks of healthy cane have been built up to such levels in some districts that it was found desirable early in 1955 to issue Proclamations, in respect of the Inkerman and Plane Creek mill areas, which made it necessary for growers to plant solely from clean stocks. Other areas are well to the fore in providing healthy planting material, and it is expected that only a small proportion of the 1956 plantings will be made with cane not derived from hot-water treated stocks.

Although the overall progress in the hot-water treatment campaign has been good, there have been instances where a complete curative effect has not been obtained with certain batches of plants, but this has not materially retarded the clean-up programme. Where adequate stocks of healthy cane are available, propagations will, of course, continue to be made exclusively from these sources, but where the stocks of clean material are insufficient to fulfil all planting requirements a realistic approach to the problem has been made by approving, as a temporary expedient, the supplementary use of suspect stocks in preference to utilizing any untreated planting material which is mainly obviously diseased.

It was realised at the outset that some contaminations were inevitable in the early stages of a campaign of this magnitude, but these have served to expose the weaknesses and have enabled the necessary corrective measures to be adopted. Better water circulation in the treatment tanks has helped to maintain a more uniform temperature around each sett in the centre of the baskets; but even where the conditions for treatment were entirely satisfactory, a small percentage of stools of certain varieties was subsequently found to be diseased. Without discounting the possibility of secondary transmission having occurred, this points to the other alternative that a number of setts may not have been freed of the disease, and if such is the case, it will be necessary for some varieties to receive a curative treatment in excess of the 50°C./2 hour standard previously specified. This aspect is to be further investigated.

In the Mackay district the clean seed programme received a temporary set-back through the unfortunate spread of chlorotic streak, which was discovered there for the first time last year. Before the full extent of the infected area was known, some plots of cane, hot-water-treated against ratoon stunting disease, were unwittingly planted

in a number of low-lying situations where flood waters drain away from the centres of chlorotic streak infection. Several of these plots developed chlorotic streak and had to be rejected as sources of clean seed unless given a further hot-water treatment at 52° C. for 20 minutes, and a halt was called on the use of any suspect material. To counter the threat from chlorotic streak, plots of hot-water-treated cane are now being established on high land, and future propagations will be made with a greater degree of confidence with planting material from these sources.

The general lack of confidence amongst many Supervisors of Cane Pest and Disease Control Boards in diagnosing the nodal symptoms of ratoon stunting disease, and the necessity for acquainting them with the newly-discovered salmon-pink discolouration obtained by slicing the internal tissues of very young diseased shoots, made it imperative that these Supervisors should receive on-the-spot tuition at the Pathology Farm at Eight Mile Plains, near Brisbane. To that end a Refresher Course was organized and held there on 18th and 19th April, 1955, when 24 representatives from various Cane Pest and Disease Control Boards and a number of other disease inspectors attended. In addition to observing ratoon stunting disease in its different phases, some of the newly-appointed Supervisors were afforded the opportunity of becoming familiar with the symptoms of a number of the older major diseases which have now disappeared from the commercial cane-growing areas of Queensland. This general stimulation of interest in sugar cane pathology has led not only to a more intensive check on the stocks of hot-water-treated cane, but also to an increased recognition of the presence of a number of minor sugar cane diseases, specimens of which are now being forwarded more regularly to Head Office for determination and advice.

Following immediately on this Refresher Course, the Annual Conference of Cane Pest and Disease Control Boards was held in Brisbane on 20th April, 1955. This conference was attended by 43 delegates and 12 Bureau officers, and it was unique in being the first one at which representatives from all 22 Boards were present. One of the main subjects for discussion concerned the operation of hot-water treatment tanks and it was demonstrated that, due to various factors adversely

**Fig. 55—Inspecting Fiji disease during the refresher course for Supervisors of Cane Pest and Disease Control Boards at the Pathology Farm at Eight Mile Plains.**

affecting circulation and transference of heat, setts were, in many instances, not receiving the standard of treatment specified. As a consequence it was arranged for all hot-water tanks to be checked under actual operational conditions during the spring months of 1955.

In connection with the so-called *Verticillium* disease which is causing some concern in the Bundaberg district, inoculations of this organism into healthy cane have not been successful in establishing the pathogenicity of this fungus, and further field observations regarding its incidence were conducted early this year. No simple method of control was revealed and there is no certainty that the problem is purely a pathological one. As a consequence it is being investigated from the agronomic angle also, and a full scale field programme is now under way.

The improvement in the Fiji disease position has been maintained, only one stool having been found in the Moreton area during the past year. With the ploughing-out of all known diseased fields in the Moreton district there are grounds for optimism that the disease may have been eradicated from that area, whilst its foothold in the Beenleigh area is now very precarious indeed. Spindle stripe disease in the Maryborough district is also yielding to the pressure against it and it is expected that by November, 1955, all known diseased blocks will have been destroyed.

When reviewing the effect of insect pests on the 1955 crop it is realised with intense satisfaction that since the advent of benzene hexachloride it is no longer necessary to assess the losses due to white grubs in multiples of tens of thousands of tons of cane. Although grub infestations were sporadic and generally of low intensity, a small but definite increase in greyback grub infestations was detected in the Innisfail area, while frenchi grubs were responsible for measurable losses in districts further north. It is evident that losses would have been much greater had BHC not been used so extensively.

The combined damage caused by grubs was responsible for a total loss of somewhat less than 5,000 tons of cane throughout the State. It is of some interest to enquire whether this could be economically reduced by a more appropriate usage of BHC. Much of the damage was located on fields not treated with any insecticide, the apparent reason being that infestations are usually sporadic on the farms concerned and the growers not convinced that their losses are of such magnitude as to warrant the use of BHC on every field of plant cane. In other cases a persistent shortage of labour and unfavourable wet conditions throughout the harvesting season resulted in some intended BHC applications being omitted. Part of the damage, particularly that due to frenchi, occurred where BHC applications were sub-standard either in amount or mode of application.

The spur-throated locust, which occurs rather infrequently in cane-growing areas and then mostly in the solitary phase, appeared in some northern districts in very large swarms, but passed on before serious damage was done. Some egg-laying took place, but the resulting young hoppers soon succumbed when the wet season rains commenced.

There were some local increases in beetle borer infestations, attributed to the difficulty of burning off plant residues during the wet weather, but other insect pests did not cause any damage of a serious nature.

Of the animal pests that visit cane fields, rats were undoubtedly the most prominent and an increase in rat damage over that of recent years was reported from many central and northern districts. There was a marked decline in the depredations of wallabies, much of which must be attributed to a wet spring providing ample feed in their natural habitat; beagle hounds made an important contribution to wallaby control.

Further data regarding the occurrence of pests and diseases, and the experimental work carried out in connection therewith, are presented on the following page.

## ENTOMOLOGICAL INVESTIGATIONS

(G. Wilson, Senior Entomologist)

### THE GREYBACK CANE BEETLE (*Dermolepida albohirtum* Waterh.)

#### Beetle Emergences and Grub Infestations

Emergences of greyback beetles were light in most northern areas during the 1954-55 summer, but grub infestations in experimental sites and damage to cane in other districts indicated that in certain localities moderate emergences had taken place. During November beetles were observed in the Miallo-Rocky Point sector of the Mossman area and in a river-bank location at Meerawa near Gordonvale, but these were seen only in very small areas on favoured feeding trees. The finding of grubs in the soil demonstrated that a moderate emergence had occurred at Frenchman's Creek near Babinda, and though growers in the South Johnstone area had not observed flights of beetles, grub infestations of slight to moderate intensity were found in experimental sites at Coorumba and Utchee Creek. In the previous year the average number of greyback grubs per stool on the Innisfail field trials was 0.57, but in 1955 this increased to 0.74, this being an underestimate of the true infestation as bandicoots had been active in devouring the grubs before the field inspections could be completed.

#### Cane Losses Resulting from Grub Damage

The total cane destroyed by greyback grubs, which amounted to 2,480 tons on 290 infested acres, was more than double the loss in the 1954 crop. This was not widely distributed throughout the State—1,590 tons were lost on 110 acres in one mill area in the Burdekin, mostly on farms not previously affected. The growers concerned have indicated their intention of using BHC in future. In another mill area of the same district 800 tons were lost from 160 acres on farms where previous infestations were sporadic and the individual growers not impressed by the need for BHC as an insurance against possible damage. A record of which farms are infested from year to year would prove or disprove the validity of that point of view.

**Fig. 56—Examining soil for microscopic insects with the assistance of a specially designed traversing stage.**

### Insecticide Trials

Field trials were continued to obtain further information on the use of soil insecticides for greyback control and the effect of BHC on soil fertility. The majority of the trials set out did not become grub infested and the volume of data secured was limited in consequence.

### Refined Versus Crude BHC

The eight dispersed replicates set out in 1953 to study this comparison were maintained as first ratoons, but in only one replicate was there sufficient grub infestation to provide results. These supported the information previously obtained from three plant crop replicates that the two forms of BHC are equally effective for grub control.

### BHC Retreatment Trials

Of nine trials in progress only one, a first ratoon crop, carried sufficient grub infestation to warrant harvesting in 1954. In that trial the average number of grubs per stool, 3.2, was sufficient on the light red volcanic soil concerned to test thoroughly the two methods of applying BHC. Single applications on the plant crop at the rates of 75 and 100 lb. of 20 per cent. BHC per acre gave first ratoon yields of 44.9 and 46.6 tons of cane per acre respectively, while these same quantities of BHC divided between plant and first ratoon applications resulted in yields of 44.6 and 45.8 tons per acre. The differences were not significant, either between methods or rates of application.

### Long Range Soil Toxicity Investigations

In a long range investigation into the effects of BHC on soil fertility, the insecticide, in crude and refined forms containing respectively 13 and 88 per cent. of the gamma isomer, was applied at varying rates per acre, ranging from the minimum considered necessary for grub control up to a total, on plant and first ratoon crops, of double that amount. Two plant crop yields have been previously reported, but these have been included in the table below to give a complete summary of the yields of cane in the plant and first ratoon crops from three trials, situated at Bundaberg, Lower Burdekin and Babinda.

There were no significant differences between yields in any other of the trials, either in respect of yield of cane, sugar content, or yield of sugar per acre.

### New Insecticides

Since BHC became established as the standard means of grub control, a number of new insecticides has been discovered. Two of these, aldrin and dieldrin, were applied on six trials to compare them with BHC against the greyback grub. None of these trial sites became grub infested in 1954, but infestations have been found on three sites in 1955 and a limited amount of information will be obtained when these are harvested.

**Plant Crop Yields of BHC Plots, Refined Versus Crude and Controls**

| | Yields in tons cane per acre | | |
|---|---|---|---|
| | Crude BHC | Refined BHC | Controls |
| Plant crops harvested, 1953— | | | |
| Bundaberg | 38·28 | 38·86 | 38·57 |
| Burdekin | 71·84 | 72·28 | 72·06 |
| *Babinda | (38·58) | (38·76) | (36·50) |
| Means of two plant crops | 55·06 | 55·57 | 55·31 |
| First ratoon crops harvested, 1954— | | | |
| Bundaberg | 35·53 | 33·27 | 35·40 |
| Burdekin | 35·87 | 34·49 | 33·48 |
| Babinda | 35·92 | 35·25 | 35·60 |
| Means of three ratoon crops | 35·77 | 34·34 | 34·83 |

*(In the plant crop at Babinda a slight grub infestation caused a loss of two tons per acre which was significant at the five per cent. level. The yields from that crop have therefore been omitted from the means).

### Damage Caused by Frenchi

A concentration of beetles of the species, *L. frenchi*, was observed on a small area near Deeral late in November and again in mid-December; only sparse emergences were observed at those times in Mossman, Hambledon and Mulgrave. However, as a natural result of large emergences in November, 1953, third stage larvae were plentiful and caused substantial losses of cane in the Mulgrave and Mossman areas, with some loss on a smaller scale in the Hambledon district. The damage was accentuated by very dry December-January weather. In other areas damage was negligible, this being fortunately so in the Mackay district for the second year in succession, in marked contrast to the considerable losses that occurred there in the 1953 crop.

The loss due to frenchi grubs amounted to 2,245 tons on 334 acres. Sixty-six per cent. of this loss occurred in the Mossman mill area which suffered over 80 per cent. of the State loss due to this species in the previous year. Whilst frenchi infestation is notoriously sporadic, the areas in which it is possible for it to occur can be reasonably well defined. In view of the complete devastation that can be wrought by frenchi grubs, the possibility exists that BHC could be used more extensively and more effectively with benefit. Part of the damage occurred where BHC had been applied, and this could be obviated by better attention to placement and quantity, having regard to the number of ratoons being grown.

Some damage was done to plant cane. While this was not large, *e.g.*, 155 tons on 36 acres in one mill area affected, the reduction in one field was estimated at eight tons of cane per acre. There is scope for a more general protection of plant crops against frenchi by applying the BHC above the setts in the drill at planting time, the plants being first very thinly covered with soil. This prevents the BHC stunting the sett roots and supports the insecticide at a level where it is also effective against greyback grubs.

### Occurrence of other species

*Lepidiota caudata*, which occurs in association with tropical rain forest rather than in the open forest favoured by *L. frenchi*, emerged in large numbers two miles north of Babinda township, but this species seldom causes major damage to cane. In the Coonarr Creek area of the Bundaberg district a hitherfo unrecorded species of white grub damaged a field of ratoon cane growing in a fine sand, and efforts will be made to establish its identity and find a satisfactory method of control.

### Field Trials and New Insecticides.

In the past, circumstances have prevented field trials with BHC against frenchi grubs from reaching the stage of defining the amount of the insecticide required as a single application on the plant crop to provide residual protection of the second ratoons; and also from determining whether or not this could be more economically achieved by re-treatment of the first ratoons. Two trials were established on plant cane in 1954 which, if subjected to frenchi infestation in the second ratoons in 1956, should yield the desired information.

In three other field trials aldrin and BHC were compared for frenchi grub control. In one of these aldrin failed to reduce a heavy infestation which consequently destroyed the first ratoons, whilst BHC gave a high degree of control. However there is some doubt regarding the aldrin dust used in this experiment being correctly formulated. Dieldrin was tested with aldrin and BHC in one trial in which a light frenchi infestation did not produce spectacular damage but some information should be obtained when the ratoons on the plots are weighed. The third trial did not become infested.

In the Isis area blanket applications of BHC at the rate of 75 lb. of 20 per cent. dust per acre and of aldrin at the rate of 40 lb. of 5 per cent. dust per acre both failed to check a heavy infestation of first stage grubs of *P. furfuracea* when these insecticides were disced in just before planting operations were carried out. In this case, however, there was little opportunity for these grubs to contact the insecticides before they changed to the second stage and attacked the germinating setts, and future attempts at control will aim at applying these insecticides before beetle emergence and egg-laying take place.

## USAGE OF BHC FOR GRUB CONTROL

The total acreage of plant and ratoons treated with BHC (actual application, not residual protection) in the 1955 crop was very much less than in any year since 1950. Treated areas totalled 38,752 acres, compared with 60,372 acres in the 1954 crop. Ratoon applications are almost entirely retreatments. These can fluctuate without indicating any change in farm practice away from the use of BHC, and the area of plant cane treated gives a truer index of the trend of BHC usage. Of the 1954 crop, 44,721 acres of plant cane were treated, *i.e.*, 36 per cent. of all plantings in the mill areas from which the data are taken. This decreased to 34,091 acres in the 1955 crop, a fall of 10,630 acres. Data concerning the total area planted are not yet available to convert this to a percentage.

In the areas concerned plant cane increased by approximately 26,000 acres between 1952 and 1953 crops as the result of the sugar industry's expansion programme. Plant cane harvested in 1954 was 22,000 acres above that in 1952. For the 1955 crop the area of plant cane is not yet known, but there was a sharp drop in the acres planted to achieve expansion, and a further decrease in plantings would be inevitable to allow the ratio of ratoon to plant cane to return to normal. Another factor which decreased the plantings for the 1955 crop was the introduction of farm peaks. BHC applications were also restricted by a very wet spring; this circumstance prevented application on 1,500 acres in one mill area and similar conditions prevailed elsewhere. A drop of over 10,000 acres in BHC applications between the 1954 and 1955 crops cannot, therefore, be taken to indicate any significant change in the growers' attitude towards its use.

## MISCELLANEOUS INSECT PESTS

### Reaction of the Funnel Ant to Insecticides

The funnel ant, *Aphaenogaster pythia* Forel which, in portions of the Tully, South Johnstone and Mossman areas, undermines the cane stool with a labyrinth of tunnels and reduces cane yields, was the subject of field trials with a range of soil insecticides. The application of aldrin dust in the drill four months after planting resulted in a highly significant increase in yield. BHC applied in the drill at planting time gave a yield difference which was significant at the 5 per cent. level. The smaller increase which resulted from the application of chlordane dust was not significant. None of the insecticides, however, effected more than a partial reduction in the ant populations. BHC was used at the rate of 1.95 lb. of the gamma isomer per acre; aldrin and chlordane were applied at 2, 4 and 8 lb. per acre. Since the yields were not correspondingly improved by the higher rates of application of the two last-mentioned insecticides, the yields have been summarised in the table below according to the insecticides used.

The harvesting of this trial is only a preliminary step towards solving what may be an obstinate problem; a wider range of insecticides and methods of application is being tested concurrently with investigations into the habits and food requirements of the ants. Diggings carried out at Mossman showed that the majority of their tunnels occurred in the lower top soil and upper sub-soil, *i.e.*, between

**Effect of Applying Various Insecticides for Funnel Ant Control**

Plant Crop Yields:—Tons of Cane per Acre

| Number of replicate plots | Insecticide Used | Yield | Increase in yield over control |
|---|---|---|---|
| 12 | Aldrin | 38·54 | 6·15 |
| 8 | BHC | 37·20 | 4·81 |
| 12 | Chlordane | 35·72 | 3·33 |
| 8 | Untreated control | 32·39 | .. |

The increase due to aldrin was significant at the one per cent. level.

six and twelve inches below the surface. On fallow land with a cover of grass and weeds the tunnels did not appear to go much deeper, but under adjacent cane stools they were found down to two feet, and in both localities chambers containing larvae and pupae were generally found at about ten inches below the surface.

### Locust Flights and Cane Damage

The spur-throated locust, *Austracris guttulosa* Walk., is normally found west of the Dividing Range in the 20-inch rainfall belt. When the insect reaches plague proportions a strong migration is induced which, at infrequent intervals over the years, results in an invasion of the coastal belt. An amazingly large swarm of such origin reached the western boundary of the Ingham district on 20th October, moved eastwards to Ingham township, splitting off small swarms and leaving in its wake multitudes of these insects on both cane and grass, and swung southwards over Bambaroo to disappear four weeks later in the sparsely settled forest country north of Townsville. At Bambaroo, on 4th November, the remnant of the main swarm was still a quarter of a mile wide and required two hours to pass overhead at about six miles per hour, the number of insects being estimated at one hundred million. The locusts showed a decided preference for short grass and herbs and although large numbers settled on cane, defoliation was of the order of only five to fifteen per cent. of the leaf blade. During the day the insects took to the wing before one could get within spraying distance, and the majority took part in a mass flight from grass to high trees at dusk. Control by the direct application of insecticides was extremely difficult. Fortunately the damage done was not so serious as to necessitate control measures being applied. A much smaller swarm reached Bartle Frere on the 10th November, having traversed the Atherton Tableland. A few fields of small cane were eaten down to ground level but recovered completely except for the loss of two weeks of early growth.

Egg-beds could not be located but young hoppers emerged in mid-December at Ingham and Bartle Frere and in isolated small swarms near Boogan. The possibility of these surviving to eat off the shoots of young cane induced some Cane Pest and

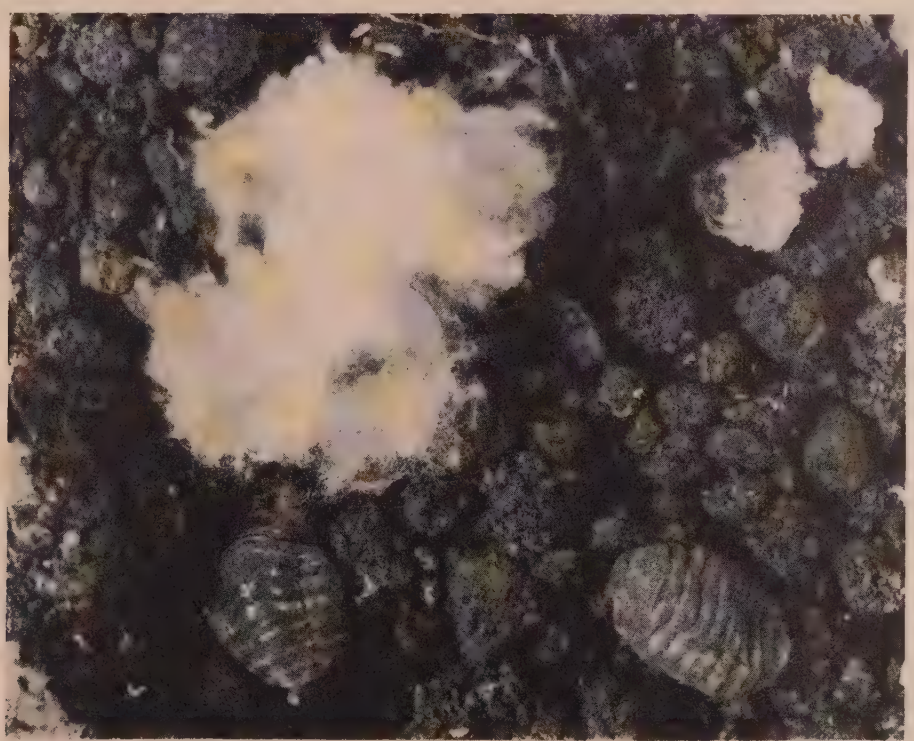


**Fig. 57—Adult females of *Margarodes* sp. exposed to show white cottony mass secreted at egg-laying. x7.**

Disease Control Boards to commence dusting operations with BHC against the wingless hoppers. However, heavy rains attaining to flood conditions during February created an adverse environment. The hoppers died when about to enter the adult stage, after some unimportant damage had been done to the leaves in a few fields of late-cut ratoons.

### Slight Increase in Beetle Borers

It could be said that the beetle borer, *Rhabdoscelus obscurus* Boisd., has been so reduced in numbers by the practice of burning before harvest that it seldom reaches pest status, but wet conditions during 1954 harvesting resulted in the accumulation of partially burned debris in a few fields and increases in beetle borer populations were noted. It is anticipated that these outbreaks will recede when field sanitation is restored to normal.

**Fig. 58—An egg mass of *Margarodes* sp. laid by one female, with cottony secretion in background. x18.**

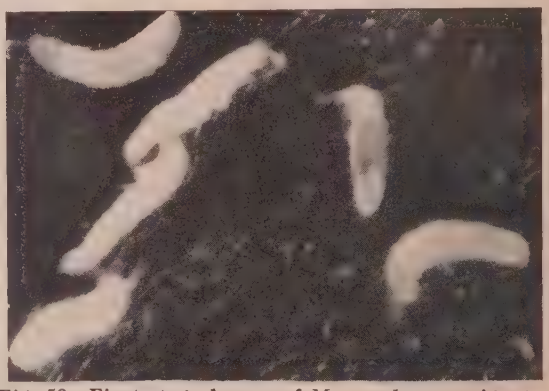


**Fig. 59—First stage larvae of *Margarodes* sp. migrating in search of suitable roots, soon after hatching. x20.**

### Aldrin and Dieldrin Tested Against Wireworms

Wireworms of the species *Lacon variabilis* Cand. affected cane germination to a small extent in a few patches in the Mulgrave area and on some new ground in the Mackay district, but the use of BHC-fertilizer mixture when planting prevented damage occurring in most areas liable to infestation. A series of trials comparing aldrin and dieldrin with BHC was set out on a number of low-lying farms in the Mackay district where it was considered that severe wireworm damage might develop. The infestations, however, proved to be only light, and germinations in the untreated control plots were down to the extent of not more than 10 per cent. on the standard BHC treatment. Under these circumstances it was not possible to show any significant differences in the degree of wireworm control effected by these different insecticides.

### Outbreak of Army Worms

Army worms of the Agrotid species *Leucania* (*Cirphis*) *unipuncta* Haw. defoliated about 60 acres of cane in the Mulgrave and Hambledon mill areas during November and December. In some fields loss of cover allowed a profuse growth of weeds. The damage amounted to four weeks loss of growth and the cost of hand-weeding. Parasitisation was not heavy. In other mill areas the incidence of leaf-eating caterpillars was negligible.

### Margarodes at Bundaberg

A heavy but localized infestation of "earth pearls," *Margarodes* sp., on a plantation in the Bundaberg district gave rise to large numbers of adult females in December, 1954. These pink adults, which surround themselves in their earthern cells with a white cottony secretion prior to egg-laying, produced large masses of eggs which subsequently hatched into podurid-like larvae. The infested field was irrigated in December, 1954, and again in January, 1955, after which the normal monsoonal rains set in. Since then these insects have almost entirely disappeared. Whether the flooding of the field at this critical period was instrumental in controlling the pest is not known, but it may not be without significance that these insects are seldom found in the wetter sugar-cane areas further north.

### A Minor Grub Pest

The wet spring of 1954 in the Bundaberg district, coupled possibly with unsound farm practices, was responsible for minor outbreaks of *Rhyparida dimidiata*, which caused damage to young ratoons. A number of field trials with BHC and aldrin dusts, applied both as blanket and drill dressings, has been set out on the worst affected farm in an attempt to secure data on the most effective means of control.

### Nematode Occurrence

Examinations of cane roots from various cane-growing areas of Queensland have revealed infestations by nematodes of the following species:—*Meloidogyne incognita* var. *acrita*, Chitwood, from Bundaberg and Ingham; *Meloidogyne javanica* (Treub) Chitwood, from Mullett Creek near Bundaberg; and *Pratylenchus zeae* Graham, from Eight Mile Plains near Brisbane. For these nematode determinations we are indebted to Mr. R. Colbran, Entomologist, of the Queensland Department of Agriculture and Stock.

## ANIMAL AND BIRD PESTS

In most mill areas rat populations increased as compared with the previous few years. Estimates of loss of cane in various mill areas range from small amounts up to as much as 6,000 tons. In northern mill areas the evidence indicated that the increased populations were chiefly of the species *Melomys littoralis* Lonnberg, whilst in Mackay *Rattus conatus* Thomas was predominant.

Wild animals which normally forage outside cultivated fields and are troublesome when dry weather reduces their natural food supply did little damage because an unusually wet spring assured lush growth of natural grass. This was true of wallabies and pigs. Although much credit is rightly due to the beagle hound for wallaby control, the remarkable decrease in damage by wallabies in the Mackay and Plane Creek districts could not be entirely attributed to the use of dogs.

Bald coots, *Porphyrio melanotus* Temm., did very little damage in most areas, but were troublesome in young cane in some parts of Mourilyan.

White cockatoos, *Kakatoe galerita* Lath., destroyed an appreciable quantity of cane situated near hills in the Proserpine and Plane Creek areas. On one farm 40 tons of cane was rendered unharvestable.

The Shining Starling, *Aplonis metallica* Temm., returned to cane fields in the Silkwood area in lesser numbers than in 1954 and when the cane was further advanced and better able to withstand the weight of the perched birds without breakage. An estimate of yield from areas damaged in the late summer of 1953-54 indicated that a field invaded by the birds late in the season suffered no loss, but in a field invaded earlier the loss may have been of the order of 20 tons or more per acre.

## OTHER INVESTIGATIONS

The entomological staff carried out investigations into the transmissibility of chlorotic streak disease by sap-sucking insects and mites. Despite the fact that large numbers of insects, both in the adult and nymphal stages, were tested over a long period, no evidence of disease transmission was obtained.

Examination of the soil for microscopic insects and mites was continued, with special attention to their distribution at various depths, and fluctuation in numbers with seasonal conditions. These investigations are being carried out with the ultimate object of ascertaining whether any of these has an influence on successful cane production, and also of assessing the incidental effect on them of soil insecticides applied for the control of known pests.

**Fig. 60—Cane planted in drums for entomological experiments at Meringa. Extensive trials are being conducted to discover whether chlorotic streak or ratoon stunting disease are being spread by insects.**

# Disease Investigations

(D. R. L. Steindl, Senior Pathologist)

## RATOON STUNTING DISEASE

The series of yield trials with diseased and healthy planting material of a number of varieties which was set out in 1953 has been harvested, and results show that a number of important commercial varieties, including Pindar, P.O.J.2878, N.Co.310, Trojan and Vidar, suffered considerable losses in yield in the plant crop (see Table A).

Q.50 showed some reduction in yield in one trial in South Queensland, but not in others in Central and North Queensland. This is of interest since it bears out observations in the field that this variety is tolerant to the disease in the Mackay district, but suffers losses in South Queensland, particularly on the drought-liable slopes in the Isis

**Table A**

**Yields of Diseased and Healthy Plots in Replicated Trials (Plant Crop)**
**Tons per acre**

| | N.Co.310 | Pindar | P.O.J.2878 | Q.50 | Trojan | Vidar |
|---|---|---|---|---|---|---|
| Healthy | 34·75 | 47·9 | 30·75 | 46·1 | 45·8 | 39·17 |
| Diseased | 28·30 | 40·9 | 26·30 | 46·4 | 34·3 | 35·00 |
| Loss | 6·45 | 7·0 | 4·45* | † | 11·5 | 4·17 |
| Healthy | .. | 41·7 | .. | 36·8 | 43·2 | .. |
| Diseased | .. | 35·8 | .. | 35·0 | 33·4 | .. |
| Loss | .. | 5·9 | .. | 1·8† | 9·8 | .. |
| Healthy | .. | 25·1 | .. | 32·1 | 37·0 | .. |
| Diseased | .. | 21·9 | .. | 27·65 | 29·6 | .. |
| Loss | .. | 3·2* | .. | 4·45* | 7·4 | .. |
| Healthy | .. | .. | .. | .. | 37·56 | .. |
| Diseased | .. | .. | .. | .. | 33·44 | .. |
| Loss | .. | .. | .. | .. | 4·12 | .. |

*Difference significant at 5 per cent. level.
†Difference not significant.
All other differences significant at 1 per cent. level.

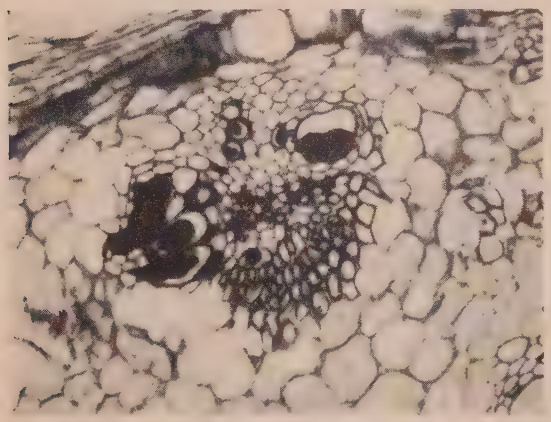


**Fig. 61—Cross section through node of stem infected with ratoon stunting disease, showing clogging of vascular bundles. x85.**

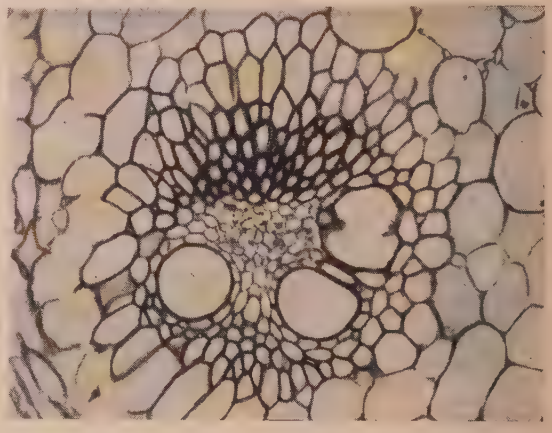


**Fig. 62—Cross section through healthy node. x85.**

area. Badila, Comus and S.J.16 did not show consistent losses, suggesting that some of these varieties, at least, may exhibit a tolerance to the disease, though the favourable conditions for growth may have influenced these results.

Observations throughout the growth of these crops indicated that differences in yield were due to poorer germination and slower early growth in the diseased plots, followed by a reduction in the total length of stalks produced. No significant differences were observed in thickness of stalks, nor in the number of stalks produced per stool in the plant crops as was the case with the early trials with Q.28. However, the trials with Q.28 were carried out in a dry year when the effects of the disease are known to be at their worst, while the current trials received favourable growing conditions.

Results from the ratoon crops of the above trials, together with another series of plant trials, will be received during the current season, and indications are that losses in ratoons, from the varieties mentioned previously, will be severe, and some may even be of the same order as in Q.28.

Hot-water treatment at 50° C. for two hours has been continued with large quantities of planting material in nearly all districts, and good supplies of apparently clean cane are available. However, even with treatments which have been accurately controlled there is reason to believe that a very small percentage of setts in some varieties is escaping the curative effect of 50° C. for two hours. A series of hot-water treatment trials involving various combinations of time and temperature, which was set out last year, also tends to confirm this. Several leading commercial varieties in each district were treated in water at 50° C. for two, two and one half and three hours, 51° C. for two hours, 52° C. for one and one half and two hours, and 53° C. for one and one half hours. Germination results showed that treatments up to three hours at 50° C., two hours at 51° C. and one and one half hours at 52° C. were not unduly detrimental with most varieties, but more severe treatments are likely to lead to a serious falling off in germination. The curative effects of these treatments have not yet been fully determined, but the indications are that the chances of getting complete control are enhanced with an increase in either time or temperature. These increases are, of course, strictly limited by the ability of the plant to survive, and it appears at present that an increase in time at the minimum temperature is preferable to an increase in temperature. The reason why certain setts are not cured

**Fig. 63—Portion of a ratoon stunting disease yield trial at Mackay prior to harvesting the plant crop. Healthy Trojan on left and diseased Trojan on right.**

at a time-temperature combination which will cure most setts is not known, but it is considered that some physical property of certain setts, such as thickness, woodiness or pithiness may be responsible. However, it is possible that secondary spread of the disease could be responsible for this apparent "escape" from the curative treatment, and further transmission studies are in progress. In spite of the above findings it is confidently believed that the majority of cane which was treated at 50° C. for two hours, for commercial plantings in 1954, is now free from the disease.

Certain disinfectants have been found effective in destroying the active principle of ratoon stunting disease in juice after a ten minute treatment time, and these are listed in Table B. Those compounds which were considered to have some possible practical application were again tested in the presence of an organic mercurial solution of the normal dipping strength such as is used for the control of pineapple disease, and it was found that this had no detrimental effect on their efficacy.

Experiments were carried out to determine whether knife infection can be counteracted by dipping setts, infected in this manner, into a solution containing a disinfectant. However, results showed that this treatment did not prevent the

development of the disease. In the early experiments with knife sterilization, the times of treatment in the various disinfectants were too short to be effective. Further work is in progress to determine the minimum safe treatment for the sterilization of knives with antiseptics such as the maximum time tested, and further experiments with longer periods of storage are in progress.

The virus was inactivated when thin discs of mature internodal tissue from diseased plants were exposed to a temperature of 51° C. for one half hour.

**Table B**

**Effects of Antiseptics and Other Compounds on Ratoon Stunting Virus**

| Materials which inactivated the virus after 10 min. exposure | per cent. | Materials which failed to inactivate the virus after 10 min. exposure | per cent. |
|---|---|---|---|
| Alcohol (ethyl) | 50 | Acriflavine | ·2* |
| Aretan | 3* | Aretan | 1* |
| Calcium hypochlorite | 10 | Boric acid | 5 |
| Dettol (chloroxylenol) | ·5 to 2·5* | Formaldehyde | 2 |
| Formaldehyde | 4 | Lysol | ·1* |
| Lysol | ·5 to 2·5* | Sodium benzoate | 2 |
| Mercuric chloride | ·1 | Sodium carbonate | 10 |
| Phenol | 1 to 2·5 | Sodium phosphate ($Na_3PO_4$) | 5–10 |
| Phenyle | 1·66 to 2·5* | Phenol | ·05 to ·1 |
| Potassium permanganate | 1 | Potassium permanganate | ·1 |
| Zephiran | ·05 to ·5 | Tannic acid | 3 |

Potassium chlorate 5 per cent. caused a germination failure.
*Percentage of commercial product. Others percentage active principle.

Dettol, Zephiran, Lysol, Phenol and Phenyle, but it is considered that a thorough swabbing or scrubbing in solutions of the strengths listed as being effective in Table B, followed by a short soak, will be a safe method of disinfection.

Root inoculations have shown that ratoon stunting disease is easily transmitted to young plants of Q.28 by cutting roots with a knife smeared with infective juice, or by cutting roots immersed in infective juice or by pouring infective juice on to uncut but probably slightly damaged roots. Stools inoculated at the time of cutting, by smearing diseased juice on the freshly cut stubble, have shown the disease in the ratoon crop, indicating that transmission takes place by this method.

Studies on the distribution of the virus within the host have shown that it occurs in leaves, stems and roots. Dilutions of juice extracted from these parts of the plant show that the concentration of the virus is approximately the same in all parts, and that it will remain infective at a dilution of roughly one part in 10,000.

Diseased juice has retained its infectivity up to four days in a household refrigerator, and up to 46 days in a deep freeze at —20° C. This was

Inoculations into setts of Q.28, Q.44, Q.50 and G.176 with infected juice from various centres have suggested the possibility that different strains of ratoon stunting disease may exist. Differences so far have shown only in intensity of discolouration in the vascular bundles.

Attempts have been made to determine the host range of ratoon stunting disease, and for this purpose a number of plants, both grasses and non-grasses, have been inoculated. In no cases have any observable effects been produced in these inoculated plants, but extracts from corn, sorghum and sweet sudan grass have produced the disease in Q.28 when back inoculations were made from six weeks to three months later. The fact that these plants can become infected, and can re-infect sugar cane is of interest, but it does not necessarily mean that they can act as alternative hosts of the disease in the field.

The positive identification of ratoon stunting disease in some varieties still remains a problem, and although the discoloured vascular bundles in more or less mature cane, and pink nodes in young shoots, can be used as a positive diagnosis in many cases, there are still instances in which symptoms are so indefinite that it is impossible to make a diagnosis, and the absence of symptoms does not

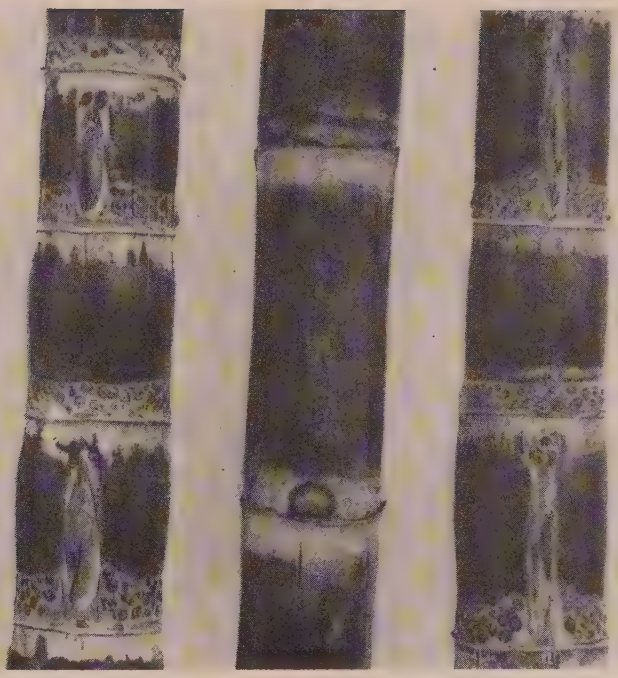


**Fig. 64—A freak effect induced by hot water treatment of S.J.4 at 50° for two hours. Note development of root primordia near tips of buds. Normal stalk in centre.**

always mean that the cane is healthy. Further work has been done with ultra-violet absorption in extracts of diseased cane, without any definite results. Another attempt has been made to prepare an antiserum against diseased juice, as a test for the disease, but also without success. For this work the virus was precipitated with half saturated ammonium sulphate and re-suspended in water for inoculations into rabbits. Some preliminary studies have been made with the Grebmeier ultra-centrifuge, and dilution inoculations made with the centrifuged preparations should reveal the extent to which the virus is precipitated by ultra-centrifugation.

Ratoons of the resistance trial planted in 1953 at Eight Mile Plains showed that several J and K series seedlings were very susceptible to ratoon stunting disease. Badila, "Thick Badila" and C.P.29/116 did not show any apparent stunting, but Oramboo, Pindar, Q.42, Q.47, Q.56, Q.59 and Trojan all showed an appreciable reduction in growth as a result of inoculation. The resistance trial planted in 1954 consisted mainly of commercial and breeding canes since, in the early trials with these varieties, many of the control plots were diseased, and a true evaluation of their resistance was not obtained.

## CHLOROTIC STREAK DISEASE

Chlorotic streak continues to be a serious disease in the low-lying, wetter areas in most parts of the State. The extensive planting of hot-water treated cane for the control of ratoon stunting disease, and the amount of chlorotic streak which has subsequently appeared in it, has emphasised the rapidity with which this disease can spread under suitable conditions, since on no previous occasions have such large quantities of known chlorotic streak disease-free material been planted in these districts.

The disease was recorded in the Mackay area for the first time last year, and it has extended over the lower-lying country there during the past year. This spread has probably been intensified by the flooded conditions of the cane lands during this period.

Insect transmission studies have been continued with this disease, but to date no transmission has been obtained. It has always been realized that spread of the disease is associated with low-lying, wet areas, but more and more evidence is accumulating to suggest that transmission is associated with an actual inundation, even though temporary, of the cane fields.

## LEAF SCALD DISEASE *Xanthomonas albilineans* (Ashby) Dowson

The inoculation of leaf scald resistance trials at the time of ratooning, following the usual sett inoculation at the time of planting is to be adopted as standard practice for these trials. Inoculation of the stubble at the time of ratooning was described in last year's report, and to date two trials have been successfully carried out, using this method of inoculation.

The trial planted in 1953 and ratooned in 1954 again showed a high percentage of infection in the standard varieties H.Q.426 (73 per cent.), Q.44 (44 per cent.), Trojan (46 per cent.) and Oramboo (28 per cent.). Q.57 showed considerably less disease than in the previous year (12 per cent. compared with a maximum count of 84 per cent. last year), while Mowbray seedling (80 per cent.), Vidar (60 per cent.) and several advanced seedlings also appeared susceptible. Co.475, Q.50, Q.56 and Q.58 and a number of seedlings did not show any symptoms and appear to be resistant to the disease.

Further experiments have been carried out to determine whether leaf scald disease can be cured by the hot-water treatments used for the control of ratoon stunting disease. Results indicate that some degree of control is obtained, but absence of symptoms in many control plants makes it difficult to draw definite conclusions.

## GERMINATION STUDIES

Germination trials were planted at Ayr, Bundaberg, and at the Pathology farm at Eight Mile Plains, near Brisbane. The Bundaberg trials were planted in early spring on pineapple disease-free farms, and were designed to ascertain the stimulative effect of Aretan, Baytan (both ethoxy ethyl mercuric chloride) and Mercane (phenyl mercuric acetate). In one trial, Aretan gave a significantly better germination at the 5 per cent. level than Baytan and Mercane, while all three were better than the control at the 1 per cent. level of significance. In the second trial, Aretan and Baytan were significantly better than Mercane and the control, at the 5 per cent. level, four weeks after planting, but by six weeks were only significantly better than the control.

The trial in the Ayr District contained Aretan, two other formulations of ethoxy ethyl mercuric chloride, two pehnyl mercuric acetate (PMA) preparations, and sodium pentachlorphenate. A small amount of pineapple disease developed in untreated control setts, but all treatments gave a satisfactory germination.

In the trial at the Pathology farm the setts were inoculated with a mixed culture of the pineapple disease causal agent *Ceratostomella paradoxa* (de Seynes) Dade., after being dipped in the various fungicidal solutions. Aretan, the two ethoxy ethyl mercuric chloride formulations, Abavit S, PMA, Dettol and Zephiran were tested. There was little to choose between the various mercurials, which all gave satisfactory germinations and which were well ahead of the Dettol, Zephiran and control. The severity of this test was indicated by the fact that pineapple disease was found in practically every plot in the trial.

Pineapple disease has not been of serious consequence during the year because of the excellent control which is obtained by the use of mercurial fungicides—a practice now standard in all areas subject to the disease. The trend away from dipping cut setts has continued, and preference is now given to the cutter-planter with attachments for either dipping or spraying the setts before they pass down the planting chute. Several new machines have been developed for this purpose and these incorporate a number of ingenious and efficient innovations in their design.

Fig. 65—"Droopy-top" affected stools compared with the top of an unaffected stalk of the same age. Variety—Pindar.

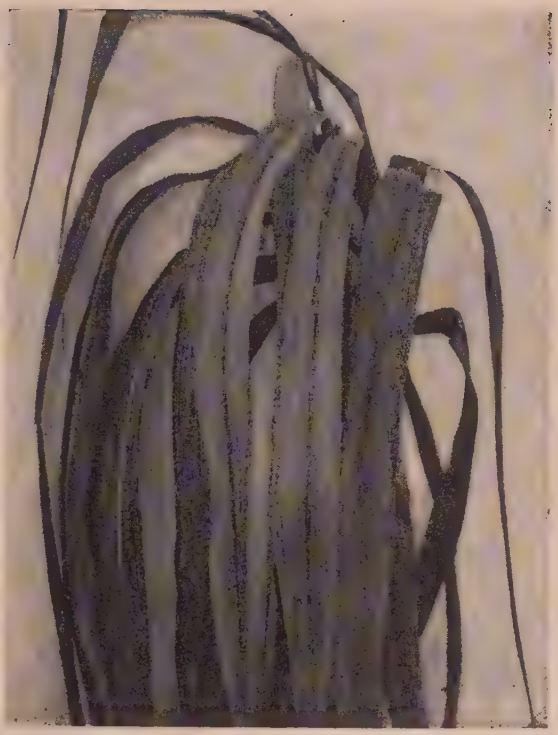


Fig. 66—Note the leaf striping on this "droopy-top" stool of Pindar growing on sandy soil at Mourilyan.

Fig. 67—The patchiness of "droopy-top" occurrence is illustrated in this photograph. The portion of the row in the foreground is badly affected, which the adjacent row is normal in development.

Fig. 68—Small "droopy-top" stools at Bundaberg in the variety Q.50.

## FIJI DISEASE

The incidence of Fiji disease has declined further during the year under review. As was the case last year, no disease was found in the Bundaberg area. In the Moreton area only one stool of Fiji disease was found in a one and one-quarter acre field of third ratoon C.P.29/116. This field was immediately destroyed. At Rocky Point seven diseased stools were rogued from three fields on three farms, all in the variety C.P.29/116.

It should be pointed out that, even after Fiji disease has been eliminated from commercial cane fields, a careful watch will need to be kept for its recurrence, since it undoubtedly still occurs in various small plantings of cow cane in South-East Queensland, as well as in Northern New South Wales. Consequently any unauthorised transfer of plants from these areas could re-introduce the disease into cane-growing areas.

Fiji disease resistance trials are still carried out at Eight Mile Plains, but since the urgent need for resistant varieties is passing with the elimination of the disease, these trials include only the more advanced seedling and standard varieties. The current ratoon trial has revealed that Q.56 is very susceptible and could not be approved in any area where the disease still exists, *e.g.*, Rocky Point. Q.58 also shows some degree of susceptibility and, like P.O.J.2878, would be a danger in the presence of the disease.

## MISCELLANEOUS

The poor ratooning, weak growth and death of stools, associated with a species of *Verticillium*, which has occurred in extensive patches in parts of the Bundaberg district, and to a less extent in some other areas, has been further investigated.

**Fig. 69—A block of C.P.29/116 in the Bundaberg district lightly affected with Verticillium disease. Note the gappy stand and the small stools within the affected area.**

Early harvested fields in these areas made good growth and it was thought that the effects of this disease would be slight; however, towards the end of September typical signs of the trouble became apparent. Heavy losses occurred on certain farms in the South Kalkie, Barolin and Gooburrum areas, with sporadic attacks elsewhere in the district. It would seem that the disease can affect germination of setts and also plant cane, but spectacular losses are apparent only in ratoons. Unfavourable weather and soil conditions at harvest time seemed to be necessary for full expression of the disease. Even under near optimum conditions for growth, however, only a moderate ratoon containing many small stools was obtained. A comprehensive programme of field work was commenced this autumn in conjunction with the Assistant Agronomist at Bundaberg.

**Fig. 70—Fruiting bodies of *Marasmius* sp. on a dead ratoon stool of Q.50 which showed typical "red spot" symptoms.**

**Fig. 71—Trash bound lower leaf sheaths with fruiting bodies of a fungus belonging to the family Polyporaceae.**

Another disease in the Bundaberg district was a cause of much concern to many farmers during the dry weather in January and early February. The young stools suddenly developed an overall red freckling and, within a fortnight, appeared to be dead. The disease was named "red spot" and was found to be prevalent in several areas of the Gin Gin district, at Booyal in the Isis mill area, and at Barolin, Avoca and Millbank in the Millaquin mill area. It was temporarily diagnosed as a form of *Marasmius* attack, and later investigations, after the wet season commenced, confirmed that all infected stools or stalks were carrying many fructifications of a *Marasmius* sp. Apparent recovery of some stools occurred, but these were found to have a very poor root system while many stalks were partially rotted at the base. The disease is being kept under observation in the field, while investigations are proceeding in Brisbane on the fungus itself.

During field investigations on *Marasmius*, fructifications of another fungus on cane were noticed. These were present on the lightly trash-bound lower leaf-sheath, but there was no apparent damage to the stools apart from this. The fungus is considered to belong to the family Polyporaceae.

Both downy mildew (*Sclerospora sacchari* Miy.) and gumming disease (*Xanthomonas vasculorum* (Cobb) Dowson) have been absent from commercial cane fields in Queensland for a number of years. Nevertheless, resistance trials with these diseases are regularly carried out on the more advanced seedlings and standard varieties, so that if an outbreak of these diseases does occur the reaction of varieties in the area concerned will be known, and immediate counter measures can be taken.

Attempts were made to control several sugar-cane diseases by hot-water or hot-air treatments, similar to those used for the control of ratoon stunting. It was already known that Fiji disease would not be cured by these treatments, and results with leaf scald are mentioned above. In addition, the causal agents of dwarf, mosaic and sclerospora diseases are not killed by these treatments. On the other hand, the downy mildew disease fungus did not survive a treatment of 52° C. for 30 minutes when the diseased setts were immersed in either water or water plus Aretan. However, it did survive the hot-air treatment at 53-54° C. for 16 hours.

Sclerospora disease has occurred in a number of areas subjected to flooding and some severe infections have been recorded. In one instance a field of Pindar in the Moreton area was estimated to contain 75 per cent. of diseased stools in the lowest section of a depression which ran through it. In the same area wild sorghum (*Sorghum verticilliflorum*) was heavily infected with the disease.

Information from overseas suggests that the fungus responsible for what has been called sclerospora disease should be included in the newly created genus *Sclerophthora*. This new genus has been based on *Sclerospora macrospora* which was re-named following the finding of a conidial stage which was distinct from that of the genus *Sclerospora*. Recent examinations of diseased cane here have shown a scanty development of conidia on the lower surface of the leaves. Detailed studies of them have not yet been made, but they appear to approximate those described elsewhere, and more detailed studies are to be made. These conidia were observed during the winter months when conditions were cool and dry. On previous occasions searches for the conidia have been made in the summer time when it has been hot and humid, since these conditions favour the production of conidia in *Sclerospora sacchari*.

Yellow spot disease (*Cercospora kopkei* Kruger) has occurred in serious proportions in the Ingham and Innisfail districts, with the result that the susceptible varieties Eros, Trojan and Luna have been severely damaged in some areas. The wet

humid conditions prevailing throughout the year have been ideal for the spread and development of the disease, which has caused the complete death of foliage and serious losses of quality in some fields.

Several small areas affected with droopy top have been recorded. This disorder occurs mainly on marginal lands and appears to be associated with a general nutrient deficiency, but its exact nature has not been determined, and further trials are in progress.

Twenty-five varieties were distributed from the Brisbane quarantine house after hot-air treatment followed by a dip in Aretan. Two Co. varieties were destroyed in quarantine because of suspicious mosaic-like symptoms, while three other varieties, which were received late last year, were ratooned and left for another year in quarantine. These were Co.285, Co.312 and Ebene 1/37. Only two varieties were imported during the year; they were P.R.1000 and Sumatra No. 1, both of which were received from the United States Department of Agriculture.

Fifteen varieties collected in New Guinea were received from Dr. Hoogland of the Commonwealth Scientific and Industrial Research Organization. These were germinated in the hot house and later transferred to open quarantine. Two, however, failed to germinate and three others had to be destroyed because of Fiji disease, leaving a total of ten survivors.

There has been a considerable increase in the demand for inoculum for velvet beans, and sufficient to inoculate 714 bushels of seed has been supplied to farmers. In addition inoculum has been supplied for 465 bushels of cowpeas, and for small lots of gambia pea, pigeon pea, blue lupin, field peas and lucerne.

# Division of Mill Technology

(J. H. Nicklin, Chief Technologist (Engr.))

REVIEW

## Crushing Rates

The steady rise in crushing rates over recent years continued in the 1954 season, when the average for the 26 mills which contribute to the Bureau Mutual Control Scheme (*i.e.*, all Queensland mills except C.S.R. and Rocky Point) was 93.51 tons per hour, as against 87.15, 78.28 and 71.47 for the three previous seasons. Up to 1951 Tully was our only mill which had exceeded the 100 tons per hour average rate, but to-day the majority are in that class.

economical to increase the size of the tandem. This increase can be made either by adding an additional mill or mills or by installing larger mills in place of those existing—the former is generally the more economical proposition.

A few years back, immediately the expected crops under the expansion scheme could be estimated, most factories placed orders for additional or larger mills. The result was that the "slack" seasons for these recent years have been very busy ones for Chief Engineers; the benefit of all the

**Fig. 72—The fleet of diesel locomotives at Mulgrave Mill.**

## Milling Trains

There does not seem to be any limit to the capacity of a given milling train, but when the rate is increased beyond a certain point the extraction starts to fall off and will continue to fall with further increase in rate. To cope with a bigger crop the crushing rate must be increased, and a point is eventually reached beyond which it is

planning and hard work, however, is now evidenced by the fact that there has been very little drop in extraction in spite of a 30 per cent. or more increase in rate.

New items of interest are the apron feeders and feeding rollers which have been installed on three mills at Fairymead and the feeding roller on the first mill at Pleystowe. In both cases operation has been quite satisfactory.

### Transport Equipment

The crushing plant is probably the least important part of a factory if rate only be considered. The cane must first of all be transported to the mill and for this purpose an adequate number of locomotives and trucks must be available if "lost time" due to cane supply is to be

**Fig. 73—Feeder carrier at Bingera.**

avoided. Apart from providing the required number of transport units, more attention has been given of recent years to obtaining prime movers which will carry out the necessary work at the lowest annual cost. With the present high cost of coal and labour, there is a strong swing towards diesel locomotives, and excellent Australian-made units are now available. Fig. 72 shows the diesel fleet at Mulgrave ready to do battle with the 1955 crop. The use of anti-friction bearings on cane trucks is increasing, but not to the extent to be expected from their advantages in maintenance and ability to allow a locomotive to haul a much heavier load.

### Cane Carriers

A cane carrier with no driver in control is probably unique in the sugar world. At least two such automatic units are now in operation in Queensland and provide a better feed to the first mill than would be possible with the most skilful manual control. Several other semi-automatic installations, for preventing knife and shredder trouble by automatically slowing down the carrier in the event of undue overload on the driving motors, also operated very satisfactorily throughout the 1954 season.

The first feeder table to be used here commenced work at Bingera during the season. Cane is picked up from trucks or storage by a gantry crane, dropped on the table and then fed as required to the main carrier. The arrangement has proved quite successful and is shown in Figs. 73 and 74.

### Steam Plant

Most mills have installed an additional boiler or boilers to meet increased steam demands, but no radical designs were included among these. The Queensland industry favours relatively small boilers with individual fans for induced draught, forced draught and secondary air, but it is doubtful whether forced draught is necessary unless economisers or air heaters are to be installed. One of these units is essential if the highest boiler efficiency is to be obtained, but in most areas at the present time there is no incentive towards this as surplus bagasse is a liability rather than an asset. However, it is hoped that within the next few years profitable ways to use any surplus will be introduced and high boiler efficiency would then be suitably rewarded.

Where new stacks are required the tendency is towards the self-supporting type which are regarded as being safe against cyclones even without the use of guy wires. Fig. 75 shows a stack of this type just prior to erection at Mossman.

**Fig. 74—Another view of the Bingera feeder carrier.**

### Electrical

With the steady increase in the use of electric power the standard of installation work is improving and some very neat examples of low voltage

generation, distribution and control may be seen in our industry.

Most of the far northern mills are now running in parallel with the Cairns Regional Electricity Board system and supplying it, during crushing hours, with a fair amount of power. This has been of considerable use to the Board, which will be rather short of generating capacity until the Tully scheme comes into operation, and at the same time has given the participating mills quite a reasonable increase in revenue.

These northern interconnections have demonstrated that there are really no technical difficulties associated with parallel running and are an excellent example to all areas.

**The Boiling House**

Plant required for treating the juice after extraction by the milling train has been increased or improved so as to cope with the extra rate of throughput. The tendency is to instal plant which will not only have the desired capacity but will perform the work efficiently and with a minimum of labour. This is particularly noticeable in some of the recent fugal installations.

Juice scales, which are regarded as essential for control purposes abroad, are still notable for their absence in the large majority of Queensland factories. Scales are the only method of determining the true sucrose entering the factory, yet only two more have been added to the single pre-war installation.

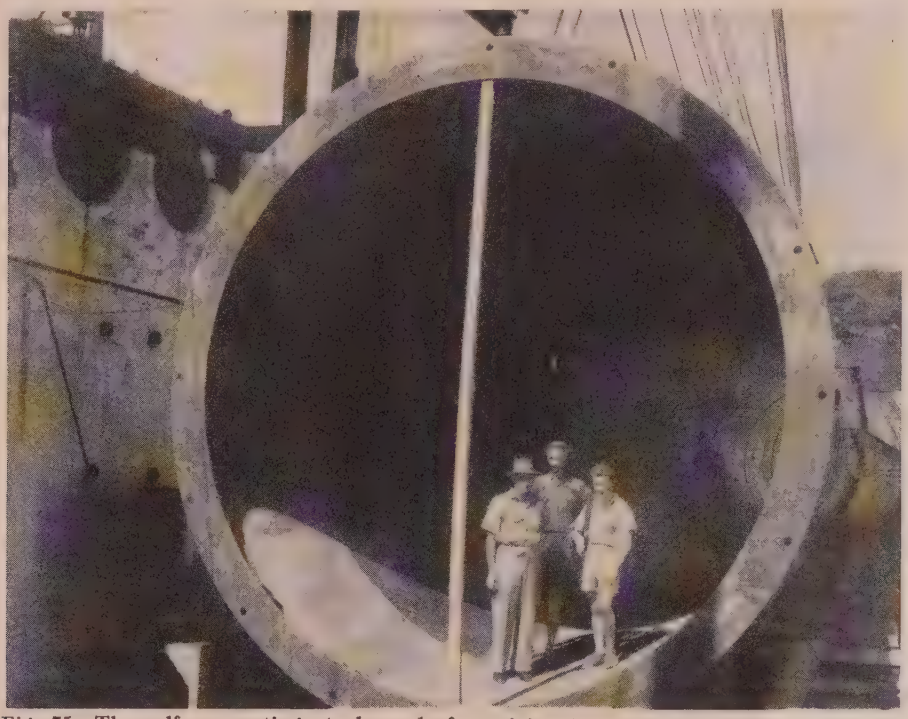


**Fig. 75—The self-supporting stack ready for raising into position at Mossman Mill.**

The production of a sugar which will meet the rather high standard now considered necessary for our export quota is presenting quite a problem to most mills. In this connection Fig. 77, which shows a large dryer under construction for Farleigh, is of interest.

**Fig. 76—Recently installed gantry at Bingera.**

### Engineering Investigations

Several visits were made by request for the purpose of reporting or advising on matters of a special nature and these are commented on below. Requests for such special visits are welcomed by the Bureau and, if the matter is urgent, receive prompt attention.

**Fig. 77—Ten foot diameter sugar drier under construction for Farleigh Mill.**

### Boiler Investigations

Investigations dealing with boiler operation were carried out at three factories. Two of these were concerned with poor steaming; in one case lack of draught was found to be the main trouble, and in the other the combustion efficiency was low due to an over-supply of top air. With the high fibred canes, which are now the general rule, steaming trouble or the burning of unreasonable amounts of extraneous fuel are not often encountered. When this problem does arise, however, a flue gas analyser is the only satisfactory way of solving it.

Recommendations covering stack sizes and fan capacities were also made during the year. The replacement of an existing stack is generally not warranted unless it is in a dangerous condition and, if replacement is necessary, a diameter of ten feet should be sufficient for crushing rates up to 140 tons per hour; the very small gain in draught to be expected with a larger stack may be obtained more cheaply by a slight increase in fan horsepower.

### Electrification

At the beginning of the year under review only two mills remained—of the 27 contacted by the Bureau—in which electricity was mainly used for lighting purposes. During the year both of these mills decided to go in for partial electrification of the auxiliary power drives; switch-board drawings and suggestions covering distribution were submitted by the Bureau and have been adopted. Neither of these mills will have sufficient generating plant to meet the anticipated load, but it is hoped that this will be rectified in the next year or two as electricity is produced very cheaply as a by-product, but can be rather expensive if purchased from an outside source.

Working drawings to finalise two other electrical extensions in which the Bureau had an interest were also submitted to the mills concerned.

### Engineering School

Towards the end of last year the mills were circularised regarding a proposal to hold a refresher course for engineers on the lines of the two which had been well received by the chemists in previous years. The course was to extend over a period of a week, with lectures in the mornings and visits to places of engineering interest in the afternoons. Although a good panel of lecturers had been organised the response from the industry was poor and the project had to be shelved.

# Chemical Technology

(L. R. Brain, Mill Technologist)

## Staff

After over 16 years of service Mr. J. L. Clayton severed his connection with the Bureau in December, 1954, to join the Central Sugar Cane Prices Board as the Chemist member. Messrs. R. Deicke and J. D. Harland joined the Mill Technology Division as Assistant Mill Technologists and, at present, are undertaking the Post Graduate course in Sugar Technology at the University of Queensland preparatory to joining the active service of the Division.

## Laboratory Operations

The normal heavy demand for standardisation and checking of equipment was sustained during last year. Certificates of accuracy were issued for 386 brix spindles, 71 flasks, 8 pipettes, 2 burettes, 6 thermometers, 6 quartz control plates and 42 polariscope tubes. Two new polariscopes were checked for accuracy and six polariscopes were overhauled and checked, two of these requiring the replacement of the calcite prisms. A hand refractometer was repaired and three new refractometers were tested.

During last year the results of tests on four quartz plates from Germany indicated that the values marked on the plates were not correct. After exhaustive tests to ensure the accuracy of equipment and techniques, the makers were informed of the discrepancies and a further batch was forwarded. These plates proved to be satisfactory and replaced the former incorrect ones. A further check will be made on the original quartz plates before they are returned to the manufacturer.

A number of materials was analysed, including samples of sugar for Isis mill and the Government analyst, samples of magnesium oxide for North Eton mill, and a sample of silt removed from cane for the Central Sugar Cane Prices Board.

## Crystallizer Studies

The recent installation of Fletcher Blanchard crystallizer units at Mossman presented an opportunity to study the heat transfer characteristics and molasses exhaustion potentialities of this type of crystallizer. On the whole, the tests were not satisfactory as the very irregular water supply to the crystallizers made the estimation of the heat transfer coefficient difficult, while at times the presence of false grain in the massecuites produced erroneous results which gave little idea of the real value of the crystallizers.

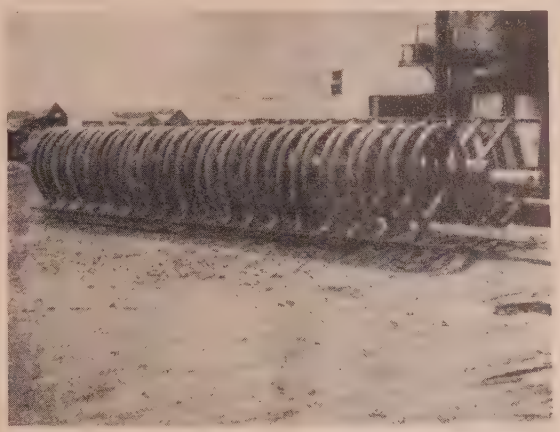


**Fig. 78—Fletcher Blanchard crystallizer elements at Millaquin Mill.**

The average value of the coefficient of heat transfer over two tests was 3.4 Btu./sq. ft./°F./hr. which compared favourably with a value of 2.5 obtained on Werkspoor crystallizers. It must be remembered that the latter units had been in service for some years and it is known that scaling does occur on the cooling surfaces. Only one test exhibited any efficiency in crystallization as the massecuite involved contained no fine grain; but this test did show that the crystallizer could be efficient under normal conditions of operation.

## Milling Tests

Officers of the Bureau assisted in an extensive series of milling tests carried out by the Sugar Research Institute at Pleystowe mill. During these tests the No. 4 mill was operated without pushers and, by increasing the surface speed of the mill, it was possible for the mill to keep up with the rest

of the train. It was agreed by the officers engaged on the tests that some form of feeding device was highly desirable. It was also established that satisfactory extraction figures could be obtained when the surface speed of the rollers exceeded 40 feet per minute which is usually the limit of speed encountered in Queensland.

In conjunction with these tests, officers of the Bureau carried out a comparison between two methods of determining pol in bagasse, one using the digestor, the other the disintegrator. This work indicated that, while the two methods yielded comparable results for final bagasse, the disintegrator gave higher figures for the pol of bagasses from mills earlier in the train. The disintegrator has other advantages such as lower temperatures of extraction, reduced time for analysis and a larger sample to increase the accuracy of the determination.

A further investigation compared the determination of fibre in cane with the disintegrator and by the normal method. For this series of tests, the two values were fairly close, the former giving a slightly higher value.

### Effet Level Regulators

The recently installed effet set at Babinda was equipped with five Mobrey level regulators, and Bureau officers were entrusted with the setting of the regulators to establish levels which would give maximum results. After consultation with the effet boilers and some manipulation, the regulators were set and it was found that the effets operated quite successfuly by adjustment of the steam valve and the speed of the pump removing the syrup from the last vessel. With these two adjustments the two main variables, viz., capacity of the set and the brix of the syrup, could be regulated and the responses were both prompt and reliable.

As it is normal practice for effet boilers to regulate the performance of effets by the manipulation of levels, it was expected that the level regulators would not be used to their full extent. However, it appears that the units are in constant use—an excellent advertisement of their value.

### Pilot Wax Plant

Following the rather unsuccessful operation of the pilot plant which extracted wax from dry mud continuously, a small batch extractor was constructed and a series of tests showed that extractions of 70-76 per cent. could be expected in 1½ hours.

During these tests it was observed that the wax content of the filter mud, which had been air-dried and stored, decreased from 15.0 to 6.6 per cent. in one week. The material in question was filter press cake from Maryborough mill, and a series of analyses on rotary filter cake from Fairymead showed that the extractable material was lost from filter cake both when air dried and when stored wet. While the original cake contained 7.9 per cent. extractable matter on a dry basis, the value dropped, in nine weeks, to 2.8 per cent. when the mud was air dried, and to 1.3 per cent. when the mud was stored in a wet condition. It was also found that the initial decomposition was more rapid for the air dried material which, however, reached a stable value when the moisture content was low. The wax content of the wet material also appeared to reach equilibrium at the much lower figure of 1.3 per cent.

These experiments stressed the necessity for developing a recovery method which could deal with wet mud immediately it was discarded from the mill. Laboratory experiments had demonstrated the feasibility of the liquid-liquid extraction of wet mud and the batch extractor has now been adapted to the extraction of a mud slurry in batch.

**Fig. 79—Stock used in the bagasse-molasses feeding trials at Yeerongpilly.**

### Molasses and Bagasse Mixtures for Stock Foods

Numerous reports from overseas countries prompted the Bureau to initiate experiments to determine the value of molasses and bagasse as a stock food. The aid of the Department of Agriculture and Stock was sought, and it was arranged

that trials could be conducted by the Animal Research Institute at Yeerongpilly, Brisbane.

Preliminary negotiations revealed that a mixture containing 70 per cent. molasses and 30 per cent. bagasse would be a suitable starting point, and fine bagasse, prepared by sieving bagasse through one-eighth inch screens, was air dried and mixed at the premises of the Protein Stockfoods Ltd., of

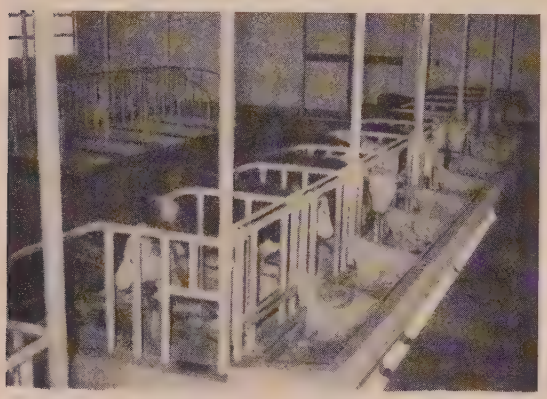


**Fig. 80—The animals in stalls during the feeding trials.**

Bundaberg. Later mixtures contained bagasse which passed through half inch screens and it was decided to use this material for further tests.

The first trials undertaken were designed to determine the palatability of the feed, the maximum intake by animals, and the minimum addition of protein supplement to maintain body weight. Meat meal and linseed meal were used as the protein feed and the animals maintained an average body weight for the first two weeks as they became accustomed to the new feed. Subsequently, these animals have increased in weight at the rate of $1\frac{1}{2}$ to 2 lb. per day. The initial trial is not yet complete.

So far some six tons of stock food have been prepared for the trials, and further trials are planned. The addition of urea to the feed as a potential source of protein is also under consideration.

### Treatment of Muds with Active Magnesia

As a consequence of the successful use of active magnesia with muds for filter presses, a quantity of this material was purchased by North Eton for a mill trial, and a Bureau officer was requested to be present as an observer. After some initial difficulties, a trial of one week's duration was effected with somewhat disappointing results. While the filtrate was crystal clear and the mud was hard and readily removed from the presses, the filtration rate showed no improvement. Active magnesia was used at a rate of one per cent. on mud, the cost of magnesia amounting to £90 for the week. A significant rise of 3.7 units of purity of the filtrates was found, but it was not considered that this was sufficient to warrant the expense of the magnesia.

As has occurred before, the full expectations from the use of magnesia in the laboratory have not been realised and it appears that it is most difficult to prepare, on a large scale, active magnesia of a similar quality to that made in the laboratory.

### Constant Temperature Room

In order to facilitate sugar analysis and standardisation of laboratory equipment, an air conditioning unit was installed in the dakr room of the Bureau's Head Office to control the temperature of the room at 20° C. Some insulation of the room was found to be necessary but the unit has performed very successfully after the initial troubles were surmounted, and the installation has been particularly useful for the checking of polariscopes, quartz plates and volumetric glassware.

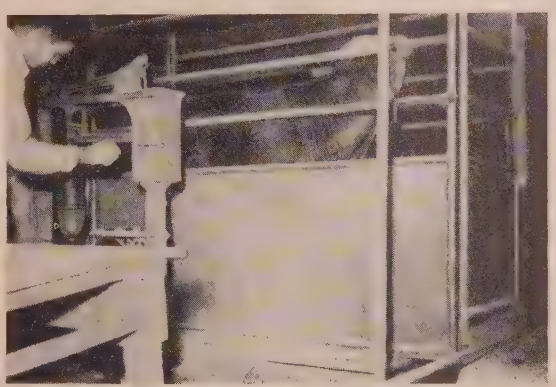


**Fig. 81—Each beast in the trial is weighed every two weeks.**

### Miscellaneous

Some preliminary experiments were carried out on the use of P.M.A.848, a polyelectrolyte from Taiwan which has been reported to assist in clarification. Laboratory work, so far, has shown little benefit from its use.

Practically all the mills were visited at least once during the season, the local problems on process and plant being discussed with mill officers. Whenever possible, a Bureau officer has been present at the meetings of the three chemists associations of the industry and it is obvious that these visits are much appreciated.

## THE 1954 SEASON

During the 1954 season, further records were established for the total tonnage of cane crushed and the sugar produced. The cane harvest amounted to 9,864,305 tons, from which 1,301,245 tons of 94 net titre sugar were made. Perhaps the most notable feature of the season was the considerable drop in the quality of the cane crushed, the decrease being due mainly to the cane in the northern district. In this area, the c.c.s. in cane dropped from 14.68 in 1953 to 12.70 in 1954, while a decline of 0.74 units for the central district and a rise of 0.39 for the southern district were recorded. For the State, the drop in c.c.s. amounted to 0.87 and, while 7.17 tons of cane were crushed per ton of 94 net titre sugar in 1953, the value was 7.58 in the 1954 season.

The total crop days required to crush this record tonnage was 6,110, the longest crushing time since the abnormally wet season of 1950. Analysis of the gross time for 1954 indicates that, while the losses due to manufacturing troubles did not increase from those of last season, cane supply was particularly troublesome. The extensive rains in the northern areas combined with extreme labour difficulties in the cane harvest were the principal factors causing delays in cane delivery.

With the increased quantities of cane to be crushed, more intensive work was demanded to deal with the crop and a further increase in the average crushing rate to 93.51 tons of cane per hour was recorded. Actually, over 50 per cent. of our mills now crush at a rate of over 100 tons of cane per hour. Despite this increase, the quality of the work did not suffer; in fact, a slight increase in pol extraction was achieved, the value being 94.85, compared with 94.81 for the 1953 season. As the maceration water added during milling did not alter appreciably, this slight increase is commendable and once again demonstrates the continued effort on the part of mill engineers to increase the extraction of milling trains in Queensland even though the crushing rate is rapidly increasing.

The mode of milling cane is slowly moving away from that of earlier years when the so-called "pusher" was almost the only method of feeding mills. The pressure feeder has displaced the pusher in many installations and the combination of a feeder roller and an apron feeder will be used at one mill during the coming season when its operation will be of great interest although the principle is in common use in overseas countries.

In company with the milling efficiency, the process work also showed some improvement over that of the 1953 season. The overall recovery increased to 85.62 and the recovery on mixed juice to 90.27 and, when considered in conjunction with the increased rate of throughput, illustrates the close control maintained on this section of the factory. A gratifying feature of the process work is the renewal of the downward trend which the true purity of the final molasses had exhibited for some years but which was upset by a significant rise in 1953. In 1954, the true purity of final molasses decreased by 0.13 and, although the actual decrease is small, a comparison with the expected purity calculated from the Douwes Dekker formula shows a much more favourable position, the difference between the actual purity and the expected purity being 3.6 units. Expansion of the low grade massecuite station has apparently been more than sufficient to cope with the increased quantity of material treated.

The undetermined loss shown is still high and, at a number of mills, it is far too high and variable to indicate that accurate chemical control is maintained in our factories. This unsatisfactory state of affairs will continue until juice weighing machines are installed. By this means, accurate chemical control based on sucrose rather than pol can be established and true efficiency and losses can be evaluated.

Sugar quality declined somewhat during 1954, the principal cause being the stricter enforcement of the penalty for marketing sugar over the pol limit of 99.

It will be noted that the total fuel consumed rose in 1954 but it must be remembered that in many instances bagasse is in plentiful supply and it is burnt inefficiently in the mill furnaces or the surplus is burnt in external furnaces. The extraneous fuel continues to be used in fair quantities, although the extra fuel per ton of cane appears to be decreasing as the years progress. A significant increase in the quantity of molasses burnt was recorded but most of this was consumed by one mill.

From an overall viewpoint, the operations of the 1954 season showed some improvement over those of the previous season. The total throughput and rate of crushing were increased in practically every factory and slight increases in extraction and overall recovery were achieved. The season concluded, however, with warnings that the production of sugar had exceeded the market requirements and curtailed production was expected for the 1955 crop.

## Table X

### Production Data for Queensland Mills for Seasons 1948-1954
### (Totals and Weighted Averages)

| Northern District | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 |
|---|---|---|---|---|---|---|---|
| Cane— | | | | | | | |
| Tons | 2,478,083 | 2,426,929 | 2,622,402 | 2,135,564 | 3,092,819 | 3,315,716 | 3,943,427 |
| Pol per cent. | 15·55 | 15·50 | 14·40 | 15·64 | 14·84 | 15·45 | 13·88 |
| Fibre per cent. | 10·55 | 10·58 | 10·35 | 11·26 | 11·24 | 11·61 | 10·93 |
| C.C.S. | 14·39 | 14·36 | 13·21 | 14·58 | 13·70 | 14·48 | 12·70 |
| Purity 1st expressed juice | 89·24 | 89·17 | 87·81 | 90·08 | 88·47 | 89·96 | 87·20 |
| Sugar— | | | | | | | |
| Tons 94 net titre | 356,959 | 345,684 | 344,944 | 304,786 | 421,921 | 467,716 | 502,276 |
| Cane per ton sugar | 6·94 | 7·02 | 7·60 | 7·01 | 7·40 | 7·09 | 7·81 |
| Pol per cent. | 98·60 | 98·42 | 98·47 | 98·52 | 98·66 | 98·81 | 98·50 |
| Net titre | 97·24 | 96·99 | 97·12 | 97·07 | 97·33 | 97·52 | 97·09 |
| Dilution indicator | 30·0 | 30·0 | 29·0 | 28·8 | 31·3 | 31·0 | 30·5 |
| Pol per cent. pol cane | 86·60 | 84·59 | 85·29 | 85·39 | 86·61 | 85·78 | 85·17 |
| Mud— | | | | | | | |
| Tons | 37,485 | 42,450 | 46,765 | 38,342 | 53,197 | 55,582 | 63,816 |
| Mud per cent. cane | 2·67 | 3·12 | 3·10 | 3·13 | 2·91 | 2·95 | 2·96 |
| Pol per cent. | 3·93 | 3·59 | 3·66 | 4·10 | 4·50 | 3·55 | 2·96 |
| Pol per cent. pol cane | 0·67 | 0·72 | 0·79 | 0·82 | 0·90 | 0·69 | 0·64 |
| Molasses — | | | | | | | |
| Gallons (1000's) | 6,087 | 6,143 | 6,737 | 4,950 | 7,905 | 7,723 | 10,246 |
| Gallons per ton cane | 4·33 | 4·51 | 4·48 | 4·04 | 4·32 | 4·17 | 4·76 |
| Brix | 86·40 | 86·57 | 86·36 | 88·82 | 88·28 | 89·87 | 89·78 |
| Apparent purity | 33·01 | 34·15 | 30·93 | 33·78 | 31·66 | 33·97 | 32·49 |
| True purity | 46·47 | 47·78 | 44·73 | 45·57 | 43·36 | 45·71 | 44·31 |
| Expected purity | .. | .. | .. | 38·36 | 37·99 | 38·90 | 38·0 |
| Reducing sugars | 18·28 | 17·96 | 20·97 | 17·59 | 18·87 | 16·07 | 20·48 |
| Pol per cent. pol cane | 5·23 | 5·68 | 5·36 | 4·86 | 5·90 | 5·62 | 6·74 |
| Final Bagasse— | | | | | | | |
| Tons | 308,282 | 308,622 | 335,620 | 295,620 | 429,961 | 446,918 | 489,784 |
| Bagasse per cent. cane | 21·93 | 22·68 | 22·26 | 24·14 | 23·48 | 24·24 | 22·74 |
| Pol per cent. | 2·86 | 3·12 | 3·04 | 3·09 | 2·97 | 3·03 | 2·63 |
| Dry substance | 51·70 | 50·70 | 50·49 | 51·33 | 52·30 | 51·63 | 51·55 |
| Pol per cent. pol cane | 4·04 | 4·75 | 4·70 | 4·77 | 4·64 | 4·73 | 4·31 |
| Undetermined loss— | | | | | | | |
| Pol per cent. pol cane | 3·46 | 4·26 | 3·86 | 4·16 | 1·95 | 3·18 | 3·14 |
| Fuels— | | | | | | | |
| Tons: Wood | 5,378 | 5,702 | 8,768 | 3,847 | 5,175 | 5,181 | 3,498 |
| Coal | .. | .. | .. | .. | .. | .. | 40 |
| Molasses | 10,691 | 8,436 | 16,691 | 6,577 | 5,951 | 1,206 | 6,982 |

*The figures for tons of cane, tons of sugar and tons of cane per ton of sugar refer to all mills. All other figures exclude C.S.R. Co. mills.

| Central District | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 |
|---|---|---|---|---|---|---|---|
| Cane— | | | | | | | |
| Tons | 2,572,089 | 2,691,364 | 2,580,013 | 1,971,468 | 2,685,687 | 3,773,830 | 4,119,775 |
| Pol per cent. | 15·98 | 15·41 | 14·96 | 16·44 | 15·95 | 16·02 | 15·27 |
| Fibre per cent. | 12·67 | 12·10 | 12·68 | 13·35 | 12·56 | 12·85 | 13·36 |
| C.S.S. | 14·76 | 14·11 | 13·93 | 15·28 | 14·80 | 14·92 | 14·18 |
| Purity first expressed juice | 88·85 | 87·59 | 89·60 | 89·66 | 89·56 | 88·82 | 89·43 |
| Sugar— | | | | | | | |
| Tons 94 net titre | 373,003 | 375,654 | 355,751 | 286,416 | 388,343 | 547,648 | 570,867 |
| Cane per ton sugar | 6·90 | 7·16 | 7·25 | 6·88 | 7·02 | 6·89 | 7·26 |
| Pol per cent. | 98·83 | 98·96 | 98·74 | 98·52 | 98·82 | 98·96 | 98·91 |
| Net titre | 97·62 | 97·91 | 97·25 | 96·81 | 97·37 | 97·71 | 97·58 |
| Dilution indicator | 28·0 | 33·0 | 29·0 | 28·2 | 30·0 | 29·5 | 27·7 |
| Pol per cent. pol cane | 86·46 | 86·27 | 86·73 | 84·12 | 86·46 | 86·24 | 86·46 |
| Mud— | | | | | | | |
| Tons | 83,008 | 86,934 | 81,414 | 64,799 | 81,139 | 133,893 | 145,162 |
| Mud per cent. cane | 3·23 | 3·23 | 3·15 | 3·49 | 3·33 | 3·49 | 3·52 |
| Pol per cent. | 2·27 | 2·67 | 2·67 | 3·36 | 3·21 | 2·95 | 2·59 |
| Pol per cent. cane | 0·46 | 0·56 | 0·55 | 0·71 | 0·57 | 0·66 | 0·60 |
| Molasses— | | | | | | | |
| Gallons (1,000's) | 13,828 | 15,378 | 10,681 | 9,649 | 12,573 | 18,690 | 18,227 |
| Gallons per ton cane | 5·38 | 5·72 | 4·14 | 4·89 | 4·68 | 4·95 | 4·42 |
| Brix | 88·83 | 88·73 | 88·57 | 90·33 | 90·45 | 89·75 | 90·15 |
| Apparent purity | 35·40 | 34·11 | 36·17 | 35·35 | 34·50 | 34·62 | 35·65 |
| True purity | 46·56 | 45·40 | 45·74 | 45·01 | 44·01 | 44·60 | 44·19 |
| Expected purity | .. | .. | .. | 40·64 | 40·80 | 39·81 | 40·7 |
| Reducing sugars | 17·30 | 19·97 | 16·19 | 16·49 | 16·09 | 18·22 | 16·64 |
| Pol per cent. pol cane | 7·05 | 7·37 | 5·73 | 5·96 | 5·92 | 6·14 | 6·00 |
| Final Bagasse— | | | | | | | |
| Tons | 657,839 | 697,490 | 668,330 | 552,250 | 695,837 | 1,010,347 | 1,116,182 |
| Bagasse per cent. cane | 25·58 | 25·91 | 25·89 | 27·34 | 25·91 | 27·01 | 27·09 |
| Pol per cent. | 2·58 | 2·67 | 2·37 | 2·71 | 2·60 | 3·07 | 2·81 |
| Dry substance | 52·99 | 50·99 | 51·48 | 51·71 | 52·40 | 51·96 | 52·67 |
| Pol per cent. pol cane | 4·12 | 4·49 | 4·04 | 4·60 | 4·19 | 5·11 | 5·03 |
| Undetermined Loss— | | | | | | | |
| Pol per cent. pol cane | 1·91 | 1·31 | 2·95 | 4·61 | 2·86 | 1·85 | 1·91 |
| Fuels— | | | | | | | |
| Tons: Wood | 9,315 | 8,576 | 10,140 | 5,084 | 3,822 | 6,985 | 3,594 |
| Coal | 244 | 743 | 528 | 225 | 233 | 181 | 81 |
| Molasses | 40 | 98 | 18 | .. | .. | .. | .. |

*1948-1949 fuel figures exclude Pioneer and Inkerman.

| Southern District | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 |
|---|---|---|---|---|---|---|---|
| Cane— | | | | | | | |
| Tons | 1,383,884 | 1,399,749 | 1,489,291 | 898,140 | 1,063,030 | 1,661,517 | 1,801,103 |
| Pol per cent. | 14·58 | 14·07 | 13·50 | 14·07 | 13·21 | 13·82 | 14·08 |
| Fibre per cent. | 14·23 | 14·80 | 14·96 | 14·56 | 14·19 | 13·52 | 14·77 |
| C.C.S. | 13·28 | 12·83 | 12·32 | 12·69 | 11·90 | 12·52 | 12·91 |
| Purity first expressed juice | 86·95 | 87·10 | 87·10 | 85·76 | 85·40 | 85·90 | 87·80 |
| Sugar— | | | | | | | |
| Tons 94 net titre | 180,077 | 175,929 | 179,149 | 113,140 | 124,350 | 205,019 | 228,102 |
| Cane per ton sugar | 7·68 | 7·96 | 8·31 | 7·94 | 8·55 | 8·10 | 7·90 |
| Pol per cent. | 99·10 | 98·90 | 98·80 | 98·80 | 98·94 | 98·90 | 99·00 |
| Net titre | 97·96 | 97·08 | 97·33 | 97·24 | 97·55 | 97·51 | 97·68 |
| Dilution indicator | 28·0 | 33·0 | 34·0 | 28·6 | 31·5 | 29·6 | 32·8 |
| Pol per cent. pol cane | 85·04 | 85·34 | 85·32 | 85·61 | 84·62 | 85·03 | 85·82 |
| Mud— | | | | | | | |
| Tons | 40,951 | 42,957 | 52,451 | 35,971 | 37,451 | 57,018 | 65,650 |
| Mud per cent. cane | 3·10 | 3·09 | 3·66 | 4·02 | 3·56 | 3·47 | 3·70 |
| Pol per cent. | 3·10 | 2·99 | 2·53 | 2·42 | 2·70 | 2·67 | 2·73 |
| Pol per cent. pol cane | 0·65 | 0·66 | 0·69 | 0·70 | 0·72 | 0·67 | 0·72 |
| Molasses— | | | | | | | |
| Gallons (1,000's) | 7 242 | 6,826 | 6,744 | 4,445 | 5,232 | 7,678 | 7,248 |
| Gallons per ton cane | 5·25 | 4·88 | 4·53 | 4·97 | 4·97 | 4·67 | 4·09 |
| Brix | 89·47 | 89·16 | 90·75 | 91·27 | 91·77 | 91·71 | 91·57 |
| Apparent purity | 37·40 | 38·48 | 37·60 | 33·84 | 34·44 | 32·75 | 36·13 |
| True purity | 46·39 | 46·80 | 45·57 | 43·72 | 43·24 | 41·74 | 43·00 |
| Expected purity | .. | .. | .. | 40·56 | 41·09 | 40·4 | 42·0 |
| Reducing sugars | 15·35 | 13·95 | 14·68 | 17·81 | 17·08 | 19·10 | 14·41 |
| Pol per cent. pol cane | 7·93 | 7·85 | 7·55 | 6·92 | 7·98 | 6·54 | 6·42 |
| Final Bagasse— | | | | | | | |
| Tons | 397,317 | 416,113 | 437,610 | 275,890 | 317,961 | 477,531 | 567,691 |
| Bagasse per cent. cane | 29·02 | 30·22 | 30·56 | 30·85 | 30·23 | 29·17 | 32·00 |
| Pol per cent. | 2·02 | 1·95 | 1·95 | 2·19 | 2·10 | 2·46 | 2·41 |
| Dry substance | 51·98 | 52·01 | 51·40 | 50·47 | 49·87 | 49·46 | 49·29 |
| Pol per cent. pol cane | 4·01 | 4·20 | 4·42 | 4·83 | 4·75 | 5·19 | 5·48 |
| Undetermined Loss— | | | | | | | |
| Pol per cent. pol cane | 2·37 | 1·95 | 2·02 | 1·94 | 1·93 | 2·57 | 1·56 |
| Fuels— | | | | | | | |
| Tons: Wood | 5,925 | 5,558 | 3,870 | 4,306 | 3,493 | 4,774 | 4,595 |
| Coal | 77 | 88 | 351 | 642 | 511 | 519 | 308 |
| Molasses | .. | .. | .. | .. | .. | .. | .. |

Mt. Bauple excluded from all except tons cane, tons sugar and tons cane per ton sugar in 1950 and from all figures in following years.

| All Queensland Districts | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 |
|---|---|---|---|---|---|---|---|
| Cane— | | | | | | | |
| Tons | 6,433,556 | 6,518,042 | 6,691,706 | 5,005,172 | 6,841,536 | 8,751,063 | 9,864,305 |
| Pol per cent. | 15·51 | 15·09 | 14·52 | 15·68 | 15·07 | 15·38 | 14·64 |
| Fibre per cent. | 12·51 | 12·41 | 12·52 | 12·99 | 12·44 | 12·69 | 13·02 |
| C.C.S. | 14·28 | 13·85 | 13·40 | 14·50 | 13·90 | 14·37 | 13·50 |
| Purity first expressed juice | 88·47 | 87·86 | 88·43 | 88·93 | 88·21 | 88·45 | 88·47 |
| Sugar— | | | | | | | |
| Tons 94 net titre | 910,049 | 897,267 | 879,844 | 704,342 | 934,614 | 1,220,383 | 1,301,245 |
| Cane per ton sugar | 7·07 | 7·26 | 7·61 | 7·11 | 7·32 | 7·17 | 7·58 |
| Pol per cent. | 98·83 | 98·81 | 98·68 | 98·58 | 98·78 | 98·91 | 98·83 |
| Net titre | 97·60 | 97·75 | 97·22 | 96·97 | 97·38 | 97·61 | 97·47 |
| Dilution Indicator | 29·0 | 31·0 | 30·0 | 28·4 | 30·5 | 29·9 | 29·9 |
| Pol per cent. pol cane | 86·16 | 85·62 | 86·00 | 84·79 | 86·21 | 85·88 | 86·00 |
| Mud— | | | | | | | |
| Tons | 161,444 | 171,981 | 180,630 | 139,112 | 171,787 | 246,493 | 274,628 |
| Mud per cent. cane | 3·02 | 3·17 | 3·27 | 3·36 | 3·23 | 3·36 | 3·41 |
| Pol per cent. | 2·86 | 2·97 | 2·88 | 3·32 | 3·56 | 3·02 | 2·71 |
| Pol per cent. pol cane | 0·56 | 0·62 | 0·65 | 0·74 | 0·70 | 0·67 | 0·63 |
| Molasses— | | | | | | | |
| Gallons (1,000's) | 27,158 | 28,356 | 24,162 | 19,044 | 25,710 | 34,091 | 35,721 |
| Gallons per ton cane | 5·07 | 5·22 | 4·33 | 4·66 | 4·62 | 4·69 | 4·44 |
| Brix | 88·46 | 88·30 | 88·55 | 90·20 | 90·04 | 90·22 | 90·34 |
| Apparent purity | 35·40 | 35·17 | 35·10 | 34·59 | 33·61 | 34·05 | 34·84 |
| True purity | 46·49 | 46·22 | 45·36 | 44·83 | 43·32 | 44·20 | 43·98 |
| Expected purity | .. | .. | .. | 39·92 | 39·90 | 39·7 | 40·2 |
| Reducing sugars | 16·95 | 17·84 | 17·19 | 17·15 | 17·21 | 17·93 | 17·28 |
| Pol per cent. pol cane | 6·78 | 7·05 | 6·07 | 5·82 | 6·25 | 6·09 | 6·28 |
| Final bagasse— | | | | | | | |
| Tons | 1,363,438 | 1,422,225 | 1,441,560 | 1,123,760 | 1,443,759 | 1,934,796 | 2,173,657 |
| Bagasse per cent. cane | 25·50 | 26·20 | 26·11 | 27·15 | 25·93 | 27·03 | 27·01 |
| Pol | 2·48 | 2·56 | 2·40 | 2·68 | 2·60 | 2·91 | 2·67 |
| Dry substance | 52·41 | 51·25 | 51·23 | 51·31 | 51·82 | 51·35 | 51·53 |
| Pol per cent. pol cane | 4·07 | 4·49 | 4·31 | 4·69 | 4·43 | 5·03 | 4·94 |
| Undetermined loss— | | | | | | | |
| Pol per cent. pol cane | 2·43 | 2·22 | 2·97 | 3·96 | 2·41 | 2·53 | 2·15 |
| Fuels— | | | | | | | |
| Tons: Wood | 20,618 | 19,836 | 22,778 | 13,237 | 12,562 | 16,940 | 11,687 |
| Coal | 321 | 1,150 | 879 | 867 | 744 | 700 | 1,152 |
| Molasses | 10,731 | 8,534 | 16,709 | 6,577 | 5,951 | 1,206 | 6,982 |

Tons of cane, tons of sugar and tons of cane per ton of sugar include all mills. All other figures exclude C.S.R. and Rocky Point mills, except—From 1950, Fuel figures include Pioneer and Inkerman. Mt. Bauple is excluded from all except tons cane, tons sugar and tons cane per ton of sugar in 1950, and from all figures in following years.

## Table XI

### Tons of Cane per Ton 94 Net Titre Sugar, 1945-1954

| Season | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 |
|---|---|---|---|---|---|---|---|---|---|---|
| Tons Cane per ton 94 N.T. Sugar .. .. | 7·06 | 7·25 | 7·26 | 7·07 | 7·26 | 7·61 | 7·11 | 7·32 | 7·17 | 7·58 |

## Table XII

### Figures for 1954 Season (Totals and Arithmetic Averages)

| | Northern | Central | Southern | All Districts |
|---|---|---|---|---|
| Tons Cane Crushed .. .. .. .. .. .. | 3,943,427 | 4,119,775 | 1,801,103 | 9,864,305 |
| Tons 94 N.T. Sugar made .. .. .. .. .. | 502,276 | 570,867 | 228,102 | 1,301,245 |
| Net Titre of Sugar .. .. .. .. .. .. | 97·03 | 97·61 | 97·60 | 97·47 |
| Tons Cane per ton 94 N.T. Sugar .. .. .. .. | 7·81 | 7·26 | 7·90 | 7·58 |
| C.C.S. of Cane .. .. .. .. .. .. | 12·73 | 14·17 | 12·94 | 13·46 |
| Coefficient of Work .. .. .. .. .. .. | 97·44 | 97·32 | 97·49 | 97·40 |
| Coefficient of Work E.S.G. .. .. .. .. .. | 92·52 | 92·39 | 92·63 | 92·49 |
| Crushing Rate .. .. .. .. .. | 106·92 | 97·67 | 77·22 | 93·51 |
| Lost Time per cent. Available Time .. .. .. | 11·59 | 8·91 | 9·98 | 9·85 |
| Fibre of Cane .. .. .. .. .. .. .. | 11·02 | 13·58 | 14·79 | 13·36 |
| Pol of Cane .. .. .. .. .. .. .. | 13·91 | 15·26 | 14·10 | 14·59 |
| First Expressed Juice— | | | | |
| Brix .. .. .. .. .. .. .. .. | 18·98 | 20·92 | 19·98 | 20·18 |
| Purity .. .. .. .. .. .. .. | 87·27 | 89·52 | 87·90 | 88·50 |
| Purity— | | | | |
| Clarified Juice .. .. .. .. .. .. | 86·59 | 88·09 | 87·48 | 87·56 |
| Syrup .. .. .. .. .. .. .. | 87·13 | 88·46 | 87·56 | 87·88 |
| Dilution per cent. First Expressed Juice .. .. .. | 23·71 | 32·44 | 37·69 | 32·04 |
| Final Bagasse— | | | | |
| Pol .. .. .. .. .. .. .. .. | 2·63 | 2·83 | 2·52 | 2·69 |
| Dry Substance .. .. .. .. .. .. | 51·60 | 52·68 | 49·93 | 51·58 |
| Pol Extraction .. .. .. .. .. .. | 95·60 | 94·85 | 94·29 | 94·85 |
| Reduced Extraction .. .. .. .. .. .. | 94·95 | 95·30 | 95·33 | 95·23 |
| Final Molasses— | | | | |
| Gallons per ton Cane .. .. .. .. .. | 4·76 | 4·42 | 4·09 | 4·44 |
| Brix .. .. .. .. .. .. .. | 89·66 | 89·68 | 90·50 | 89·93 |
| Apparent Purity .. .. .. .. .. .. | 32·75 | 35·92 | 36·35 | 35·32 |
| True Purity .. .. .. .. .. .. .. | 44·57 | 44·36 | 43·12 | 44·03 |
| Expected Purity .. .. .. .. .. .. | 38·2 | 40·7 | 41·7 | 40·4 |
| Reducing Sugars .. .. .. .. .. .. | 20·43 | 16·65 | 14·33 | 16·81 |
| Final Mud— | | | | |
| Per cent. Cane .. .. .. .. .. .. | 2·89 | 3·58 | 3·74 | 3·47 |
| Pol per cent. Mud .. .. .. .. .. .. | 3·26 | 2·94 | 2·85 | 2·98 |
| Sugar— | | | | |
| Pol .. .. .. .. .. .. .. .. | 98·47 | 98·92 | 98·97 | 98·83 |
| Reducing Sugars .. .. .. .. .. .. | 0·50 | 0·27 | 0·18 | 0·30 |
| Ash .. .. .. .. .. .. .. | 0·19 | 0·21 | 0·24 | 0·21 |
| Moisture .. .. .. .. .. .. .. | 0·36 | 0·23 | 0·25 | 0·27 |
| Dilution Indicator .. .. .. .. .. .. | 31 | 28 | 33 | 30 |
| Pol Balance— | | | | |
| Sugar (Recovery) .. .. .. .. .. .. | 85·04 | 86·12 | 85·29 | 85·62 |
| Bagasse Loss .. .. .. .. .. .. | 4·40 | 5·16 | 5·71 | 5·15 |
| Molasses Loss .. .. .. .. .. .. | 6·86 | 6·03 | 6·39 | 6·33 |
| Mud Loss .. .. .. .. .. .. .. | 0·64 | 0·66 | 0·74 | 0·68 |
| Undetermined Loss .. .. .. .. .. | 3·06 | 2·03 | 1·87 | 2·22 |
| Boiling House Efficiency .. .. .. .. .. | 94·47 | 95·27 | 95·73 | 95·23 |
| Boiling House Efficiency E.S.G. .. .. .. .. | 94·03 | 94·95 | 95·43 | 94·88 |
| Fuels (as equivalent Bagasse per cent. Cane)— | | | | |
| Wood .. .. .. .. .. .. .. | 0·31 | 0·18 | 0·85 | 0·41 |
| Coal .. .. .. .. .. .. .. .. | 0·01 | 0·01 | 0·04 | 0·02 |
| Molasses .. .. .. .. .. .. .. | 0·43 | 0·00 | 0·00 | 0·10 |
| Total added .. .. .. .. .. .. | 0·75 | 0·19 | 0·89 | 0·53 |
| Bagasse .. .. .. .. .. .. .. | 23·95 | 29·42 | 31·77 | 28·88 |
| Total Fuel .. .. .. .. .. .. .. | 24·70 | 29·61 | 32·66 | 29·41 |
| Crop Days .. .. .. .. .. .. .. | 2,177 | 2,410 | 1,523 | 6,110 |

Tons of cane, tons of sugar, tons of cane per ton of sugar and Crop Days include all mills. All other figures exclude C.S.R. and Rocky Point Mills.

## Table XIII

### Sugar Produced in Districts, 1954 Season, with Peak Allocations

| Districts | Tons 94 Net Titre Sugar | | | Production per cent. Peak |
|---|---|---|---|---|
| | Produced | Peak | Excess Production over Peak | |
| Northern | 502,276 | 468,900 | + 33,376 | 107·12 |
| Central | 570,867 | 480,000 | + 90,867 | 118·13 |
| Southern | 228,102 | 222,000 | + 6,102 | 102·75 |
| All Districts | 1,301,245 | 1,170,900 | +130,345 | 111·13 |

## Table XIV

### Cane Milled and Sugar Yielded, 1954 Season

| Mills | Tons Cane Crushed | *Tons 94 n.t. Sugar made | Tons Cane per ton Sugar | |
|---|---|---|---|---|
| | | | 1954 | 1953 |
| Mossman | 257,109 | 32,108 | 8·008 | 7·146 |
| Hambledon | 390,574 | 52,298 | 7·468 | 6·906 |
| Mulgrave | 384,782 | 49,718 | 7·739 | 6·913 |
| Babinda | 354,969 | 42,074 | 8·437 | 7·422 |
| Goondi | 318,870 | 39,243 | 8·126 | 7·403 |
| Mourilyan | 288,324 | 35,434 | 8·137 | 7·277 |
| South Johnstone | 430,964 | 53,023 | 8·128 | 7·079 |
| Tully | 437,927 | 54,730 | 8·002 | 7·290 |
| Victoria | 687,268 | 89,353 | 7·692 | 6·813 |
| Macknade | 392,640 | 54,295 | 7·232 | 6·970 |
| Northern District Totals and Averages | 3,943,427 | 502,276 | 7·851 | 7·089 |
| Invicta | 183,366 | 25,598 | 7·202 | 6·949 |
| Pioneer | 403,808 | 59,047 | 6·839 | 6·717 |
| Kalamia | 401,868 | 59,701 | 6·731 | 6·637 |
| Inkerman | 513,114 | 74,159 | 6·919 | 6·810 |
| Proserpine | 382,115 | 50,108 | 7·626 | 7·190 |
| Farleigh | 381,529 | 52,533 | 7·263 | 7·084 |
| Racecourse | 373,123 | 50,221 | 7·430 | 7·000 |
| Pleystowe | 376,460 | 50,439 | 7·464 | 6·834 |
| Marian | 330,256 | 44,237 | 7·466 | 6·735 |
| Cattle Creek | 159,201 | 21,074 | 7·554 | 6·904 |
| North Eton | 228,599 | 31,522 | 7·252 | 6·966 |
| Plane Creek | 385,336 | 52,228 | 7·378 | 6·968 |
| Central District Totals and Averages | 4,119,775 | 570,867 | 7·217 | 6·891 |
| Fairymead | 304,460 | 37,750 | 8·065 | 8·382 |
| Qunaba | 143,468 | 18,135 | 7·911 | 8·530 |
| Millaquin | 316,786 | 40,445 | 7·833 | 7·850 |
| Bingera | 328,989 | 41,836 | 7·864 | 8·127 |
| Gin Gin | 89,297 | 10,384 | 8·599 | 8·678 |
| Isis | 319,380 | 41,357 | 7·723 | 7·932 |
| Maryborough | 128,581 | 16,378 | 7·851 | 7·960 |
| Moreton | 142,993 | 18,695 | 7·649 | 7·696 |
| Rocky Point | 27,149 | 3,122 | 8·696 | 8·956 |
| Southern District Totals and Averages | 1,801,103 | 228,102 | 7·896 | 8·104 |
| All Districts Totals and Averages | 9,864,305 | 1,301,245 | 7·581 | 7·171 |

*Local Sales included.

## Table XV

**Average Performance of Queensland Mills, excluding C.S.R. and Rocky Point Mills, 1953-1954 Seasons**
**(Arithmetic Averages)**

| | Northern | | Central | | Southern | | All Districts | |
|---|---|---|---|---|---|---|---|---|
| | 1953 | 1954 | 1953 | 1954 | 1953 | 1954 | 1953 | 1954 |
| Cane— | | | | | | | | |
| Pol | 15·48 | 13·91 | 16·12 | 15·26 | 13·82 | 14·10 | 15·26 | 14·59 |
| Fibre | 11·62 | 11·02 | 12·78 | 13·58 | 13·69 | 14·79 | 12·80 | 13·36 |
| Purities— | | | | | | | | |
| First expressed juice | 89·99 | 87·27 | 88·80 | 89·52 | 85·86 | 87·90 | 88·17 | 88·50 |
| Clarified juice | 89·47 | 86·59 | 87·44 | 88·09 | 85·47 | 87·48 | 87·30 | 87·56 |
| Syrup | 87·86 | 87·13 | 87·68 | 88·46 | 85·61 | 87·56 | 87·09 | 87·88 |
| Molasses— | | | | | | | | |
| Gallons per ton cane | 4·17 | 4·76 | 4·95 | 4·42 | 4·67 | 4·09 | 4·69 | 4·44 |
| Apparent purity | 34·24 | 32·75 | 34·58 | 35·92 | 32·88 | 36·35 | 33·98 | 35·32 |
| Recovery overall | 85·59 | 85·04 | 85·88 | 86·12 | 84·71 | 85·29 | 85·45 | 85·62 |
| Recovery overall E.S.G. | 85·28 | 84·63 | 85·60 | 85·84 | 84·41 | 85·03 | 85·16 | 85·31 |
| Recovery on mixed juice | 89·87 | 88·95 | 90·59 | 90·80 | 89·62 | 90·45 | 90·13 | 90·27 |
| Recovery on mixed juice E.S.G. | 89·54 | 88·53 | 90·30 | 90·49 | 89·30 | 90·17 | 89·82 | 89·94 |
| Boiling House efficiency | 94·11 | 94·47 | 95·06 | 95·27 | 95·94 | 95·73 | 95·11 | 95·23 |
| Boiling House efficiency E.S.G. | 93·73 | 94·03 | 94·75 | 94·95 | 95·59 | 95·43 | 94·77 | 94·88 |
| Pol extraction | 95·24 | 95·60 | 94·79 | 94·85 | 94·52 | 94·29 | 94·81 | 94·85 |
| Reduced extraction | 94·83 | 94·95 | 94·91 | 95·30 | 95·10 | 95·33 | 94·95 | 95·23 |
| C.C.S. | 14·45 | 12·73 | 14·89 | 14·17 | 12·51 | 12·94 | 14·06 | 13·46 |
| Coefficient of work | 95·99 | 97·44 | 96·87 | 97·32 | 98·19 | 97·49 | 97·07 | 97·40 |
| Coefficient of work E.S.G. | 90·88 | 92·52 | 91·91 | 92·39 | 93·16 | 92·63 | 92·06 | 92·49 |

## Table XVI

**Analysis of Gross Time, 1954 Season, excluding C.S.R. and Rocky Point Mills**

| | Total Hours | Per Cent. Gross Total Hours | Per Cent. of Available Hours |
|---|---|---|---|
| Crushing Time | 83,684·95 | 67·96 | 90·28 |
| Lost Time— | | | |
| Manufacture | 3,836·28 | 3·12 | 4·14 |
| Cane Supply | 5,170·27 | 4·20 | 5·58 |
| Total Available Hours | 92,691·50 | 75·28 | 100·00 |
| Premeditated and Week-end Stops | 30,443·26 | 24·72 | — |
| Gross Total Hours | 123,134·76 | 100·00 | — |

## Table XVII

**Total Crop Days, All Mills, 1945-1954**

| | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Crop Days | 4,872 | 3,740 | 4,289 | 5,708 | 5,593 | 6,469 | 4,089 | 5,046 | 5,515 | 6,110 |

**Average Crushing Rates, 1945-1954, excluding C.S.R. and Rocky Point Mills**
**(Arithmetic Averages)**

| | 1945 | 1946 | 1947 | 1948 | 1949 | 1950 | 1951 | 1952 | 1953 | 1954 |
|---|---|---|---|---|---|---|---|---|---|---|
| Tons Cane per hour | 59·32 | 59·48 | 60·55 | 66·33 | 68·74 | 72·35 | 71·47 | 78·28 | 87·15 | 93·51 |

## Table XVIII

**Fuels Calculated as Equivalent Bagasse Per Cent. Cane, 1945-1954**
**(Arithmetic Averages)**

| Year | Wood | Coal, etc. | Molasses | Total Added | Bagasse | Total Fuel |
|---|---|---|---|---|---|---|
| **Northern District** | | | | | | |
| 1945 .. .. .. | 1·830 | — | 1·552 | 3·382 | 23·021 | 26·403 |
| 1946 .. .. .. | 2·287 | — | 1·088 | 3·375 | 22·858 | 26·233 |
| 1947 .. .. .. | 1·167 | 0·005 | 0·913 | 2·085 | 22·988 | 25·073 |
| 1948 .. .. .. | 0·672 | — | 1·535 | 2·207 | 23·063 | 25·270 |
| 1949 .. .. .. | 0·726 | — | 1·102 | 1·828 | 23·242 | 25·070 |
| 1950 .. .. .. | 1·050 | — | 1·878 | 2·928 | 24·468 | 27·396 |
| 1951 .. .. .. | 0·598 | — | 1·220 | 1·818 | 27·169 | 28·987 |
| 1952 .. .. .. | 0·598 | — | 0·640 | 1·238 | 27·413 | 28·651 |
| 1953 .. .. .. | 0·562 | — | 0·111 | 0·673 | 25·413 | 26·086 |
| 1954 .. .. .. | 0·308 | 0·008 | 0·434 | 0·750 | 23·952 | 24·702 |
| **Central District** | | | | | | |
| 1945 .. .. .. | 1·372 | 0·092 | 0·326 | 1·790 | 28·144 | 29·934 |
| 1946 .. .. .. | 2·730 | 0·132 | 0·132 | 2·994 | 25·183 | 28·177 |
| 1947 .. .. .. | 1·487 | 0·025 | 0·019 | 1·531 | 28·068 | 29·599 |
| 1948 .. .. .. | 1·617 | 0·037 | 0·002 | 1·656 | 28·497 | 30·153 |
| 1949 .. .. .. | 0·899 | 0·153 | 0·005 | 1·057 | 27·397 | 28·454 |
| 1950 .. .. .. | 0·763 | 0·053 | 0·001 | 0·817 | 29·731 | 30·548 |
| 1951 .. .. .. | 0·564 | 0·028 | — | 0·592 | 32·369 | 32·961 |
| 1952 .. .. .. | 0·331 | 0·029 | — | 0·360 | 30·507 | 30·867 |
| 1953 .. .. .. | 0·359 | 0·018 | — | 0·377 | 28·334 | 28·711 |
| 1954 .. .. .. | 0·182 | 0·008 | — | 0·190 | 29·420 | 29·610 |
| **Southern District** | | | | | | |
| 1945 .. .. .. | 3·565 | 0·059 | — | 3·624 | 30·550 | 34·174 |
| 1946 .. .. .. | 5·693 | 0·697 | — | 6·390 | 29·341 | 35·731 |
| 1947 .. .. .. | 3·785 | 0·141 | — | 3·926 | 30·388 | 34·314 |
| 1948 .. .. .. | 1·977 | 0·009 | 0·012 | 1·998 | 31·010 | 33·008 |
| 1949 .. .. .. | 1·633 | 0·016 | — | 1·649 | 32·138 | 33·787 |
| 1950 .. .. .. | 0·694 | 0·060 | — | 0·754 | 35·285 | 36·039 |
| 1951 .. .. .. | 1·362 | 0·164 | — | 1·526 | 34·485 | 36·011 |
| 1952 .. .. .. | 1·160 | 0·110 | — | 1·270 | 33·614 | 34·884 |
| 1953 .. .. .. | 0·956 | 0·078 | — | 1·034 | 29·309 | 30·343 |
| 1954 .. .. .. | 0·845 | 0·044 | — | 0·889 | 31·767 | 32·656 |
| **All Queensland Districts** | | | | | | |
| 1945 .. .. .. | 2·218 | 0·058 | 0·524 | 2·800 | 27·781 | 30·581 |
| 1946 .. .. .. | 3·516 | 0·270 | 0·341 | 4·127 | 25·842 | 29·969 |
| 1947 .. .. .. | 2·238 | 0·062 | 0·226 | 2·526 | 27·684 | 30·210 |
| 1948 .. .. .. | 1·519 | 0·018 | 0·374 | 1·911 | 28·098 | 30·009 |
| 1949 .. .. .. | 1·122 | 0·067 | 0·266 | 1·455 | 28·106 | 29·561 |
| 1950 .. .. .. | 0·808 | 0·043 | 0·434 | 1·285 | 30·225 | 31·510 |
| 1951 .. .. .. | 0·818 | 0·063 | 0·282 | 1·163 | 31·820 | 32·983 |
| 1952 .. .. .. | 0·648 | 0·047 | 0·148 | 0·843 | 30·748 | 31·591 |
| 1953 .. .. .. | 0·589 | 0·032 | 0·026 | 0·647 | 27·960 | 28·607 |
| 1954 .. .. .. | 0·414 | 0·018 | 0·100 | 0·532 | 28·880 | 29·412 |

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